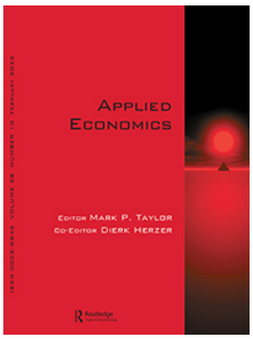

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Institutional ownership, free float, and systematic risk

Paulo Morais Francisco

School of Economics, University of Algarve, Faro, Portugal

ABSTRACT

This study investigates how institutional ownership (IO) and free float (FF) jointly affect firms' systematic risks. It contends that larger institutional stakes increase the dollar imbalance subject to common flows, whereas a greater tradable float broadens the set of funds that can trade synchronously. Both channels should increase the stock market beta. Using a cross-section of 12,655 non-financial firms from 93 countries, unconditional, downside (β^-), and upside (β^+) capital asset pricing model betas over two-, three-, and five-year windows are analysed. The results confirm that IO and FF are positively and significantly associated with unconditional and downside betas. These relationships remain robust after controlling for firm size, valuation, profitability, leverage, liquidity, and industry fixed effects, indicating that the ownership and tradability channels explain systematic risk beyond standard fundamentals. The impact of IO is pronounced for upside beta. Two-stage least squares regressions corroborate the baseline results while addressing endogeneity concerns. Additional tests show that the IO effect is concentrated in advanced economies, while the FF effect remains robust across geography, development status, and firm size. This study evinces the trading flow hypothesis that ownership concentration and tradability are the additive drivers of systematic risk.

KEYWORDS

Systematic risk; beta+; beta-; institutional ownership; free float

JEL CLASSIFICATION

G32; G11; G12; G15; D81

I. Introduction

Systematic risk is the primary factor that determines equity prices and firms' costs of capital (Lintner 1965; Mossin 1966; Sharpe 1964). Empirical studies link differences in betas mainly to fundamentals such as operating leverage, capital structure, and demand cyclicality (Francisco 2025; Kogan, Li, and Zhang 2023). However, today's equity landscape is increasingly shaped by the trading behaviour of large institutional investors. Mutual funds, pension funds, sovereign wealth funds, and exchange-traded funds (ETFs) constitute approximately 40% of the global market capitalization. When these investors experience correlated inflows or redemptions, their synchronized trades propagate shocks across baskets of securities, inflating systematic risk (Ben-David, Franzoni, and Moussawi 2018; Greenwood and Thesmar 2011 (hereafter, GT); Jylhä, Suominen, and Tomunen 2023).

A second, less examined factor is free float (FF) – the proportion of shares available for trading after excluding insider and strategic blocks. FF determines the inventory that absorbs institutional flows: the larger the float, the easier it is for institutions to build or unwind positions in lockstep, strengthening the propagation of market-wide shocks (Bostanci and Kilic 2010; Zhang, Tian, and Wirjanto 2009). Despite this, FF is usually treated as a liquidity control rather than a driver of systematic risk; its joint analysis with institutional ownership (IO) has received little attention. Simultaneously, most studies rely on unconditional beta, overlooking that investors value upside and downside exposures differently and that downside beta commands a distinct premium (Ang, Chen, and Xing 2006; Estrada 2002, 2007). Therefore, a theoretical gap exists. Trading flow and fragility explanations emphasize correlated institutional flows; however, the role of FF as a state variable shaping tradable inventory and synchronized trading eligibility is not modelled explicitly in a way that generates clean, testable cross-sectional predictions alongside IO.

Beyond this academic gap, a practical gap exists. Beta is a core input into cost-of-equity estimates,

CONTACT Paulo Morais Francisco pmfrancisco@ualg.pt School of Economics, University of Algarve, Gambelas Campus, Building 8, Faro 8005-139, Portugal

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portfolio risk limits, index construction, and macro-prudential monitoring. However, many applied risk frameworks implicitly treat beta as a function of fundamentals and past returns while giving limited explicit attention to ownership composition and tradable share supply, even though these features determine how correlated fund flows transmit shocks across stocks. This creates an implementable but under-evidenced question for investors, exchanges, and regulators: Do IO and FF systematically shift measured market beta (and especially downside beta) and does this depend on market development and market structure?

Therefore, empirical literature remains fragmented, especially from a global perspective. Studies on IO examine a single country or region and do not model FF as an explicit state variable even though tradable supply is central to how flows translate into price co-movements. Conversely, the FF literature analyses individual markets and treats institutional presence as a background rather than a key conditioning factor. Therefore, little is known about how IO and FF jointly shape systematic risk in a unified cross-market setting or whether these channels operate differently in advanced versus emerging markets, where disclosure regimes, investor bases, and market depth diverge.

GT's 'fragility' framework provides a useful lens for analysing these dynamics. In their model, systematic risk is amplified when large investors with correlated mandates hold significant stakes in firms. Ownership concentration exposes stocks to common flow shocks (a risk concentration channel), while a larger FF broadens the eligibility for benchmark-constrained strategies and facilitates synchronized trading (a synchronization channel). Building on this framework, this study addresses three questions: (i) Do IO and FF jointly increase market beta once standard fundamentals are controlled for? (ii) Are the effects symmetrical across the upside and downside betas? (iii) Do they systematically vary according to market development and firm size?

To address these gaps, this study compiles a harmonized December 2023 snapshot of institutional holdings, FF, and market information for 12,655 listed firms in 93 countries. For each firm, it uses CAPM betas from Refinitiv, reported for trailing two-, three-, and five-year windows, including unconditional, upside (β^+), and downside (β^-) components. Guided by the trading-flow framework of GT, it explores whether stocks that combine deep IO with abundant FF bear systematically higher market betas, particularly on the downside. This study contributes theoretically by extending GT's fragility framework to treat FF as an explicit state variable and empirically by testing the resulting ownership – liquidity – risk channel in a unified global cross-country setting. By linking the scale of common ownership to the depth of tradable share supply, this study provides harmonized global evidence on the joint role of IO and FF in explaining unconditional and asymmetric betas.

This study's empirical tests corroborate the trading flow hypothesis. Across the full sample, higher IO is associated with higher market betas and FF has an independent, positive coefficient of similar magnitude. These results are robust to alternative beta horizons and to the inclusion of controls for size, value, leverage, liquidity, and instrumental variable specifications. This evidence aligns with GT's prediction that common ownership and ample inventory jointly amplify systematic risk.

This study makes three major contributions to existing literature. First (theoretical contribution), it extends GT's fragility logic by treating FF as an explicit tradability state variable alongside IO, which clarifies two complementary channels through which trading flows can map into systematic risk: risk concentration channel (IO) and synchronization channel (FF). Second (empirical contribution), using a harmonized global cross-section of 12,655 non-financial firms from 93 countries and Refinitiv unconditional, upside (β^+), and downside (β^-) betas over two-, three-, and five-year windows, it provides cross-market evidence that IO and FF are the additive drivers of beta, documents asymmetries across β^+ and β^-, and shows systematic heterogeneity by market development and firm size; instrumental variable specifications address endogeneity concerns. Finally (policy/practical contribution), it translates the findings into implications for risk monitoring and market design, highlighting that ownership composition and tradable supply are measurable features that are incorporated into the risk dashboards, stress tests, and index/rebalancing

considerations by regulators, exchanges, index providers, and institutional investors.

The remainder of this paper is organized as follows: Section II reviews the relevant literature. Section III presents the theoretical model and testable predictions. Section IV outlines the data and empirical methodology. Section V presents the main results, and Section VI discusses the robustness checks. Finally, Section VII concludes the study with limitations, future research directions, and policy implications.

II. Literature review

Systematic risk is the share price uncertainty that remains even after an investor holds a well-diversified portfolio; therefore, it is the only kind of risk for which investors are compensated. In the capital asset pricing models (CAPMs) of Sharpe (1964), Lintner (1965), and Mossin (1966), this exposure is summarized by beta, the covariance of a stock's return with the market portfolio scaled by market variance. Beta feeds directly into the cost of equity and hence into firms' weighted average cost of capital, influencing everything from project selection to regulatory capital charges. Early studies treat beta as a by-product of the underlying fundamentals – operating leverage, financial leverage, or cyclicality of demand; however, subsequent work shows that who trades a stock and how they trade it are important in determining its systematic covariance.

This insight motivates the trading flow (or 'crowding') view of systematic risk. This view begins with Shleifer's (1986) observation that, when a stock is added to (or deleted from) a major index, the index-tracking funds that replicate that benchmark must adjust their portfolios simultaneously. The one-sided order flow generates non-fundamental price pressure, which is quickly arbitraged across the entire index basket. The returns of newly added stocks and that of other synchronous constituents spike even though their own cash flow prospects remain unchanged. Barberis and Shleifer (2003, 2005) 'investor-habitat' models generalize this logic. They assume that investors are segmented into cohorts that prefer particular asset baskets, such as large-cap indices, value portfolios, and sector ETFs, with each cohort receiving correlated capital inflows and outflows. As members of the same habitat rebalance on the same days and with the same weights, their trades are highly synchronized. Market makers absorb part of the order imbalance but a portion remains in prices because supplying liquidity is costly when inventories are skewed. The residual price impact, which is common to all securities in the basket, mechanically inflates the covariance of each stock with the aggregate market factor. In equilibrium, this manifests as excess co-movement; stocks sharing an investor's habitat exhibit higher betas, and the betas move in lockstep with the intensity of cohort flows even when no new fundamental information arrives. GT crystallize the crowding idea by viewing a stock through the lens of its owners' liquidity needs. Picture the firm's shareholder list as a set of mutual funds, each holding a measurable number of shares. When these funds receive new money or face redemptions, they buy or sell all portfolio holdings in approximately the same proportions. The resulting synchronized order flow pushes prices because liquidity providers absorb the inventory risk. GT label a stock's vulnerability to joint flows as fragility'. Major owners of a highly fragile stock experience large, correlated inflows and outflows; even moderate shocks to those funds generate sizable, one-sided trades in the stock, nudging its return in the same direction as the broader market wave created by those funds. In their model, extra price pressure adds a strictly positive wedge to stock market covariance, meaning that fragility translates directly into a higher beta. Crucially, the determinant is who the holders are and how synchronized their flows are, placing ownership composition at the centre of systematic risk formation.

Subsequent studies have examined the trading flow view along three complementary dimensions. (i) Breadth and turnover in IO: Using the Russell 1000/2000 reconstitution as a quasi-experiment, Jylhä, Suominen, and Tomunen (2023) uncover 'beta bubbles': when the number of distinct institutional holders, or their portfolio-turnover rate, rises sharply, CAPM beta amplifies and abnormal returns fall in a mirror image; the effect is driven by short-horizon funds and fades within approximately six months. (ii) ETFs as flow concentrators: Ben-David, Franzoni, and Moussawi (2018) treat index rebalancing as an instrument for ETF ownership and show that a one-standard-deviation increase in ETF weight increases the median stock volatility from the 55th to the 65th percentile.

Although most price impact reverses, return autocorrelation becomes more negative and high-ETF stocks earn a compensating risk premium of up to 56 bp per month, evincing that ETF-induced volatility contains a systematic component. (iii) Size and heterogeneity of the shareholder base: Examining Swedish firms, Jankensgård and Vilhelmsson (2018) find that volatility rises as the number of institutional owners grows or as more shares are held by micro-stakes below 0.1%, whereas concentrated, long-term blocks dampen variability. They attribute the positive link to intensified, overlapping trading among dispersed owner bases.

Additional international evidence underscores the role of institutional investors in shaping systematic risk. Faias and Ferreira (2017) examine 45 countries and show that stocks with higher IO exhibit stronger co-movement with global and industry factors, consistent with institutions acting as a force of financial integration across borders. De George et al. (2019) document that IO increases tail risk co-movement among U.S. banks, particularly during downturns and for institutions with higher capital needs. In Europe, Pellegrini et al. (2023) show that systemic risk is reduced when ownership is concentrated in large blockholders but increases when ownership is dispersed across numerous institutional investors. By contrast, Saghi et al. (2023) show that ownership concentration significantly elevates systemic risk in Western European banks, especially when institutional investors or states are dominant shareholders. Finally, Li, Hao, and Liu (2025) provide evidence from China that common IO among non-financial firms amplifies systemic risk through correlated earnings management and heightened interconnectedness. These studies highlight that the IO risk nexus is observable across diverse institutional environments, reinforcing the importance of considering global heterogeneity in investor prevalence.

FF – the proportion of shares that can be traded once insider and strategic blocks are excluded – emerges as a catalyst for higher systematic risk whenever large investors trade in synchrony. As a larger float allows benchmark-constrained funds, ETFs, and high-turnover institutions to build deeper, overlapping positions, it enlarges the common order flow that GT's model translates directly into market covariance. The empirical evidence is consistent. In Turkey, stocks in the highest float quartile display approximately 18% more conditional volatility than their low-float counterparts, a gap attributed to the ease with which concentrated trades sweep through broader public float (Bostanci and Kilic 2010). For Chinese A-shares, the variation in FF alone earns an annual risk premium of approximately 7% after standard risk factors are added, indicating that float carries a priced systematic component (Zhang, Tian, and Wirjanto 2009). Natural float shocks underscore the effect of supply: when IPO lock-ups expire, the freely tradable float often doubles (and can triple in tech IPOs), trading volume jumps by approximately 40%, and share prices show a 1 to 3% immediate drop, with long-term underperformance for the Internet firms (Field and Hanka 2001; Ofek and Richardson 2003).

Studies that focus only on IO show that correlated investor flows raise co-movement and risk (Greenwood and Thesmar 2011; Jylhä, Suominen, and Tomunen (2023) and that ownership breadth/dispersion increases volatility (Jankensgård and Vilhelmsson 2018), while herding amplifies common shocks (Sias 2004). In most settings, FF is held constant or treated as a control. By contrast, studies that focus only on FF link tradable float to liquidity, volatility, and risk premia (Bostanci and Kilic 2010; Zhang, Tian, and Wirjanto 2009) and to supply-driven shocks around lock-up expiries (Field and Hanka 2001; Ofek and Richardson 2003) but do not model exposure to common institutional flows. This study integrates these strands by modelling ownership (IO) as a risk-concentration channel and tradability (FF) as a synchronization channel and testing their joint implications for unconditional and asymmetric (upside/downside) betas in a broad cross-country setting.

Recent studies reinforce the links between risk sensitivity, ownership dispersion, and liquidity dynamics. Using intraday versus overnight returns, Insana (2022) shows that stock market betas are strongly state dependent, while Roy et al. (2025) document that major stock price crashes are followed by persistent increases in firms' systematic risk, underscoring that the beta itself responds to downside risk. On the ownership side, Eugster and Wang (2023) provide international evidence that the presence of large blockholders materially affects

stock price crash risk, highlighting how ownership dispersion and control concentration shape firms' risk profiles. Finally, recent studies focusing on institutional investors have revisited the liquidity channel. Bradrania, Elliott, and Wu (2022) show that foreign IO increases liquidity commonality in Australia, Chen (2025) finds that common IO reduces liquidity commonality in China via enhanced transparency, and Dinh and Tran (2024) document that IO is systematically related to stock liquidity in an emerging market setting. By decomposing beta into components associated with IO and FF, this study directly connects to this new literature on how ownership structure and liquidity co-movements condition the sensitivity of systematic risk.

Collectively, these three theoretical strands motivate this study's framework. First, the CAPM view links systematic risk to covariation with aggregate fundamentals. Second, the market micro-structure and liquidity models imply that order flow imbalances interacting with limited risk-bearing capacity generate persistent, market-wide co-movement. Third, IO and limits-to-arbitrage theories show that correlated mandates and balance sheet constraints synchronize trade across related securities. In this study's model, these insights translate into two observable channels: risk-concentration channel (IO) and synchronization channel (FF). Section III formalizes these mechanisms and derives two propositions: both IO and FF increase stock market beta.

III. Model and testable predictions

This section embeds this study's set-up into a broader theoretical framework that integrates asset pricing, market micro-structure, and IO theories. In the classical CAPM perspective, systematic risk (beta) reflects covariation with aggregate fundamentals (Lintner 1965; Sharpe 1964). Market micro-structure research shows that non-fundamental trading – order-flow imbalances that interact with limited risk-bearing capacity – can also generate persistent price co-movements (Amihud and Mendelson 1986; Kyle 1985; Pástor and Stambaugh 2003). Related work emphasizes liquidity as a priced risk factor for asset returns (Acharya and Pedersen 2005) and documents the commonality in liquidity across stocks (Chordia, Roll, and Subrahmanyam 2000), reinforcing the idea that market-wide flow shocks are transmitted. Furthermore, IO theories predict correlated trading mandates (Admati and Pfleiderer 1988; Scharfstein and Stein 1990; Shleifer and Vishny 1997; Sias 2004) and occasional herding among large investors. This study builds on GT's 'fragility' mechanism by formalizing how two observable levers, the scale of institutional participation and breadth/synchronization of tradability, map into systematic risk.

Within this integrated view, IO operates as a risk concentration channel: a larger proportion of a firm's equity is held by investors subject to common liquidity shocks, amplifying the price impact when balance sheet capacity in the limit order book is scarce (Shleifer and Vishny 1997). FF operates as a synchronization channel: Broader tradability increases eligibility for index/ETF and benchmark-constrained strategies (Ben-David, Franzoni, and Moussawi 2018), tightening cross-fund flow correlation and transmitting market-wide shocks into the stock's covariance with the market.

GT argue that limited risk-bearing capacity in the limit order book causes price fragility: when several institutional owners buy or sell simultaneously, their trades leave a permanent footprint that emerges in the CAPM beta. The resulting 'fragility beta' is the conditional covariance between the flow-driven component of an individual stock's return and flow-driven component of the value-weighted market return. GT assert that this covariance depends only on the (i) size of the dollar positions exposed to flows and (ii) covariance structure of those flows; the fundamentals enter separately and additively.

$r_{i,t+1}$ denotes the excess return on stock i from date t to $t+1$;

$r_{m,t+1}$ denotes the contemporaneous excess return on the value-weighted market portfolio;

$\mathbf{f}_{i,t} = (f_{i1t}, \ldots, f_{iK_it})' \in \mathbb{R}^{\mathbb{K}}$ represents the vector of dollar inflows and outflows to the K_i institutional funds invested in firm i's registry; with stock-specific covariance matrix $\Omega_{i,t} = Cov(\mathbf{f}_{i,t})$. Following GT, I assume mean-zero flows and allow a general variance – covariance matrix $\Omega_{i,t}$ to capture how float raises off-diagonal correlation;

$y_{i,t}$ denotes the market capitalization of firm i;

$FF_i \in (0, 1]$ measures FF, defined as the fraction of shares available for public trading after subtracting insider, government, or other strategic block holdings;

$IO_i \in (0, 1]$ measures IO share, that is, the fraction of total equity held by institutions and $IO_i < FF_i$;

I define institutional positions in tradable-dollar terms as follows:

$$\mathbf{W}_{i,t} = IO_i\, FF_i\, y_{i,t}\, \widetilde{\mathbf{W}}_{i,t}, \tag{1}$$

where $\widetilde{\mathbf{W}}_{i,t}$ represents the vector of normalized fund ownership shares with $1'\widetilde{\mathbf{W}}_{i,t} = 1$. Thus, $\widetilde{\mathbf{W}}_{i,t}$ captures the composition of institutional holders (breadth and concentration), whereas $IO_i\, FF_i\, y_{i,t}$ scales the dollar magnitude of the flow-exposed positions.

Permanent price impact is governed by the constant $\lambda > 0$; larger λ implies less risk-bearing capacity in the limit order book. These definitions provide the one-period return on stock i as follows:

$$r_{i,t+1} = \alpha_i + \varepsilon_{i,t+1} + \lambda \frac{\mathbf{W}_{i,t}^{\top}\mathbf{f}_{i,t}}{FF_{\mathrm{i}}\, y_{i,t}}, \tag{2}$$

where $\varepsilon_{i,t+1}$ is the fundamental news orthogonal to institutional flows. The single FF_i in the denominator cancels the identical factor inside $\mathbf{W}_{i,t}$; therefore, any influence of float on beta must come from the *covariance* term and not from per trade depth.

The empirical intuition as to why a float affects covariance is straightforward. High-float firms meet the eligibility requirements of index funds, sector ETFs, and benchmark-constrained active managers, all of which trade in a tightly synchronized fashion because their mandates are tied to the same indices or passive baskets. Consequently, the off-diagonal elements of the flow covariance matrix grow with the float. I capture this with $\theta_i = \kappa FF_i^{\phi} (0 < \kappa \langle 1, \phi \rangle 0)$ in the decomposition $\Omega_{i,t} = \sigma^2\left[(1-\theta_i)\mathbf{I}_{K_i} + \theta_i \mathbf{J}_{K_i}\right]$. Moreover, high float broadens IO. Empirically, the number of 13F reporters increases as FF increases, that is, $K_i = K_0 FF_i^{\eta}, \eta > 0$. Incorporating these definitions into GT's covariance algebra and noting that the value-weighted market portfolio uses weights $\omega_j = y_{j,t} / \sum_l y_{l,t}$, the denominators $FF_j y_{j,t}$ in each constituent's flow term cancel when I aggregate, leaving the market-wide flow exposure $\mathbf{V}_t = \sum_j \omega_j IO_j \widetilde{\mathbf{W}}_{j,t}$. Then, the conditional covariance between $r_{i,t+1}$ and $r_{m,t+1}$ is $\lambda^2\sigma^2\kappa IO_i FF_i^{\eta+\phi}\left(\widetilde{\mathbf{W}}_{i,t}^{\mathrm{T}}\mathbf{V}_t\right)$. Dividing by $\mathrm{Var}(r_m)$ yields the flow component of beta:

$$\beta_i^{\mathrm{flow}} = \frac{\lambda^2\sigma^2 K_0 \kappa}{\mathrm{Var}(r_m)}\left[\widetilde{\mathbf{W}}_{i,t}^{\mathrm{T}}\mathbf{V}_t\right] IO_i FF_i^{\gamma}, \gamma = \eta + \phi > 0. \tag{3}$$

$\left[\widetilde{\mathbf{W}}_{i,t}^{\mathrm{T}}\mathbf{V}_t\right]$ loads composition (breadth/concentration), IO_i scales exposure to flow-induced shocks, and FF_i^{γ} captures synchronization via correlated mandates. Total beta decomposes as $\beta_i = \beta_i^{\mathrm{fund}} + \beta_i^{\mathrm{flow}}$.

Proposition 1 (IO and systematic risk). Holding fundamentals constant, the flow-driven component of beta increases monotonically with IO.

$$\frac{\partial \beta_i^{\mathrm{flow}}}{\partial IO_i} = \frac{\beta_i^{\mathrm{flow}}}{IO_i} > 0. \tag{4}$$

This result follows from the GT's fragility framework and limits-to-arbitrage theory (Shleifer and Vishny 1997) because a larger fraction of equity held by institutions concentrates on exposure to correlated liquidity shocks.

Proposition 2 (FF and systematic risk). Holding IO constant, the flow-driven component of beta increases monotonically with FF:

$$\frac{\partial \beta_i^{\mathrm{flow}}}{\partial FF_{\mathrm{i}}} = \gamma \frac{\beta_i^{\mathrm{flow}}}{FF_i} > 0. \tag{5}$$

This reflects the synchronization channel, whereby a greater float broadens ownership and increases correlated trading mandates (Admati and Pfleiderer 1988; Sias 2004).

The above propositions yield two testable implications for the cross-section of stock betas:

H1 (IO and systematic risk): Controlling for fundamental risk exposures and firm characteristics, CAPM beta increases with IO (IO_i).

H2 (FF and systematic risk): Conditional on IO_i and the same controls, CAPM beta increases with FF (FF_i).

These hypotheses are empirical translations of Propositions 1 and 2 and are thus derived directly from an integrated theoretical framework that combines asset pricing, market micro-structure, and IO theories. Therefore, this framework unifies the CAPM view of systematic risk as a covariance with fundamentals, micro-structure view of risk as amplified by order-flow imbalances, and institutional view of correlated trading mandates. By nesting GT's fragility beta and extending it with ownership scale and tradability, this study provides a cohesive theoretical foundation and empirically testable predictions.

IV. Empirical model

This analysis draws on a global cross-section of 12,655 publicly listed, non-financial firms from 93 countries. The sample includes all listed non-financial firms with available IO, FF, and financial data from Refinitiv Eikon. Tables A1–A3 summarize the sample characteristics. The dependent variables are the unconditional CAPM beta (β_i), upside beta (β_i+), and downside beta (β_i−), obtained from Refinitiv Eikon's December 2023 snapshot. The key explanatory variable is IO (IO_i), measured as the percentage of total shares held by investors subject to 13F-type disclosure requirements, as reported by Refinitiv. This definition includes institutional investors such as mutual funds, pension funds, insurance companies, investment advisers, and other professional asset managers with holdings above regulatory disclosure thresholds. Refinitiv harmonizes reporting standards across jurisdictions so that non-U.S. institutions are captured when they are subject to equivalent disclosure regimes, ensuring broad international comparability. Importantly, this measure does not explicitly distinguish between foreign and domestic institutions or between active and passive investors, as such classifications are not systematically available in the Refinitiv database. Therefore, this study's baseline specification employs aggregate IO. Nevertheless, the results should be interpreted with the awareness that IO is heterogeneous across investor types, reflecting differences in trading style, benchmarking, and geographic scope. The second key explanatory variable is FF (FF_i), defined as the proportion of outstanding shares that are publicly available for trading, as reported by Refinitiv. This measure excludes strategic and closely held stakes, such as those owned by company insiders, founding families, governments, and other blockholders, whose shares are unavailable in the market. Firm-level controls – log assets, book-to-market ratio, leverage, quick ratio, and others – are obtained from FY2022 financial statements to ensure that they precede the risk measures and mitigate simultaneity concerns.

Refinitiv computes betas over fixed trailing windows, regressing firm returns on the benchmark index designated as the company's primary reference (e.g. the S&P 500 for U.S. firms). This study uses these published values directly. For the unconditional beta, Refinitiv estimates the standard market model:

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_{i,t}, \beta_i = \frac{\mathrm{Cov}\left(r_{i,t}, r_{m,t}\right)}{\mathrm{Var}\left(r_{m,t}\right)}. \quad (6)$$

The five-year beta uses monthly returns from December 2018 to December 2023 (≈60 observations), while the three- and two-year betas use weekly returns over the corresponding windows (≈156 and 104 observations, respectively).

Moreover, this study's design indirectly addresses concerns regarding the impact of the COVID-19 shock on systematic risk estimates. As all betas are measured as of December 2023, the sample windows (2019–2023 for the five-year, 2021–2023 for the three-year, and 2022–2023 for the two-year betas) necessarily encompass the pandemic period. The five-year specification spans pre-COVID and post-COVID years, while shorter windows isolate estimates that are progressively more dominated by the pandemic and its aftermath. Therefore, this multi-horizon approach provides a built-in robustness check of whether the COVID-19 crisis drives this study's results. Jha and Tiwari (2025) highlight the importance of explicitly considering the pandemic when analysing IO and risk outcomes. This study's framework accommodates this concern by comparing the

betas across horizons that differ in their exposure to the pandemic period.

In addition to overall betas, Refinitiv reports upside (β^+) and downside (β^-) betas, which are estimated by conditioning the market model on the sign of the benchmark return. Upside betas use only up-market observations ($r_{m,} > 0$), while downside betas use downmarket observations ($r_{m,} < 0$):

$$\beta_i^+ = \frac{Cov\left(r_{i,t}, r_{m,t} | r_{m,t} > 0\right)}{Var\left(r_{m,t} | r_{m,t} > 0\right)} \text{and}$$
$$\beta_i^- = \frac{Cov\left(r_{i,t}, r_{m,t} | r_{m,t} < 0\right)}{Var\left(r_{m,t} | r_{m,t} < 0\right)}. \quad (7)$$

The same trailing windows and data frequencies are applied for unconditional betas, monthly for the five-year horizon and weekly for the three- and two-year horizons, using the firm's country index to identify up- and downmarket states.

To empirically test the trading flow hypothesis, I specify a reduced-form regression framework that maps IO and FF onto firm-level market betas. Formally, the estimated linear model is given by

$$\beta_i = \alpha + \gamma_1 \mathrm{IO}_i + \gamma_2 \mathrm{FF}_i + X_i' \delta + \varepsilon_i, \quad (8)$$

where β_i is the unconditional, upside (β^+), or downside (β^-) CAPM beta over trailing two-, three-, or five-year windows; IO_i denotes the IO; FF_i is the FF ratio; $\boldsymbol{X_i}$ collects the firm-level controls (e.g. size, book-to-market, leverage, and liquidity); and ε_i is an idiosyncratic error, with robust standard errors.

Under the trading flow hypothesis, both higher IO and larger FF raise systematic risk. Hence, $\gamma_1 > 0$ and $\gamma_2 > 0$.

V. Results and discussion

Table 1 reports summary statistics for all variables used in the study, and Table 2 presents the correlation coefficients. The two ownership variables, IIO and FF, are conspicuous. Mean IO is just 12.7%, with a large standard deviation (29.2% points). The percentile panel confirms that the distribution is extremely skewed: the median firm has zero reported IO, and even the 75th-percentile value is 0. Only in the upper tail does IO rise sharply, implying a large mass of closely held or small firms that attract no 13F filers, alongside a smaller

Table 1. Summary statistics.

Variable	N	Mean	S.D.	Min	p50	Max	Skew
(1) 2-year beta	10,288	0.937	0.577	−2.800	0.860	9.699	1.017
(2) 2-year beta-	10,569	0.918	0.764	−7.259	0.859	7.755	−0.149
(3) 2-year beta+	10,611	0.879	0.847	−8.131	0.783	9.563	0.539
(4) 3-year beta	12,455	1.021	0.516	−2.163	0.936	7.390	0.910
(5) 3-year beta-	12,557	1.031	0.673	−4.872	0.949	9.944	0.807
(6) 3-year beta+	12,562	0.997	0.753	−2.859	0.900	9.922	0.789
(7) 5-year beta	9,643	1.100	0.622	−3.600	0.996	6.429	0.547
(8) 5-year beta-	12,540	1.233	1.088	−9.214	1.233	8.837	−0.509
(9) 5-year beta+	12,568	1.231	1.112	−9.754	1.158	9.247	0.924
(10) IO	12,655	12.74	29.22	0.000	0.000	135.1	2.129
(11) FF	12,653	61.47	37.22	0.000	71.79	100.0	−0.494
(12) M/B ratio	147,816	2.901	3.847	0.000	1.705	26.06	3.656
(13) Assets (log)	146,707	22.55	2.073	5.697	22.53	26.40	−0.185
(14) ROA	147,816	3.957	6.707	−12.36	3.482	17.46	−0.239
(15) Quick ratio	147,816	2.195	1.826	0.000	1.318	5.218	0.826
(16) Debt-to-equity	147,816	95.04	109.9	−0.579	55.90	415.6	1.669
(17) Company age (log)	12,250	3.196	0.821	0.000	3.258	4.812	−0.642
(18) Dividend yield	147,816	63.91	13,367	0.000	0.000	4.7E + 06	315.9
(19) Cash (% assets)	146,707	0.068	0.115	−0.034	0.024	1.000	3.479

This table presents the summary statistics of the variables used in this empirical study, including the number of observations, mean, standard deviation, minimum (min), median (p50), maximum (max), and skewness (skew). The two- and three-year betas represent each stock's sensitivity to market movements over weekly two- and three-year periods, while the five-year beta is similarly calculated but over a monthly five-year window. IO represents the percentage of outstanding shares owned by institutional investors (e.g. mutual funds and ETFs). FF represents the percentage of outstanding shares available for trading after deducting insiders' shares and other strategic blockholders. The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. All financial and firm-level data are extracted from the Refinitiv Eikon database. Betas were obtained in December 2023, whereas the other fundamental variables corresponded to the most recently available years for each fiscal year.

Table 2. Correlation coefficients.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) 2-year beta	1.000									
(2) 2-year beta-	0.531*	1.000								
(3) 2-year beta+	0.648*	0.219*	1.000							
(4) 3-year beta	0.721*	0.345*	0.517*	1.000						
(5) 3-year beta-	0.451*	0.673*	0.197*	0.562*	1.000					
(6) 3-year beta+	0.518*	0.104*	0.720*	0.687*	0.277*	1.000				
(7) 5-year beta	0.557*	0.390*	0.352*	0.498*	0.340*	0.324*	1.000			
(8) 5-year beta-	0.184*	0.214*	0.064*	0.231*	0.262*	0.117*	0.500*	1.000		
(9) 5-year beta+	0.266*	0.153*	0.204*	0.333*	0.222*	0.266*	0.587*	0.270*	1.000	
(10) IO	0.209*	0.094*	0.178*	0.116*	0.007	0.094*	0.138*	0.054*	0.155*	1.000
(11) FF	0.070*	−0.051*	0.097*	0.042*	0.022	0.048*	0.089*	0.031*	0.093*	0.343*
(12) M/B ratio	0.058*	−0.019	0.077*	−0.012	−0.072*	−0.006	0.080*	0.013	0.084*	0.084*
(13) Assets (log)	−0.128*	−0.129*	−0.032*	−0.146*	−0.015	0.000	0.012	−0.021	0.054*	−0.057*
(14) ROA	−0.140*	−0.024	−0.070*	−0.070*	−0.014	−0.120*	−0.154*	−0.064*	−0.124*	−0.112*
(15) Quick ratio	0.004	−0.055*	−0.006	−0.056*	−0.007	0.017	0.060*	0.037*	0.042*	0.140*
(16) Debt-to-equity	−0.054*	−0.024	−0.007	0.018	0.087*	0.064*	−0.002	0.020	0.030*	−0.027*
(17) Company age (log)	−0.152*	−0.037*	−0.118*	−0.101*	0.008	−0.070*	−0.161*	−0.074*	−0.140*	−0.174*
(18) Dividend yield	−0.128*	−0.080*	−0.091*	−0.050*	0.000	0.000	0.000	−0.004	−0.002	−0.006
(19) Cash (% Assets)	0.133*	0.021	0.084*	0.046*	−0.061*	0.057*	0.144*	0.046*	0.114*	0.195*

Variables	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(11) FF	1								
(12) M/B ratio	−0.011	1							
(13) Assets (log)	−0.116*	−0.097*	1						
(14) ROA	−0.083*	0.052*	0.087*	1					
(15) Quick ratio	−0.057*	−0.063*	0.559*	0.061*	1				
(16) Debt-to-equity	0.156*	−0.087*	0.105*	−0.174*	−0.082*	1			
(17) Company age (log)	−0.033*	−0.040*	0.350*	−0.162*	0.146*	0.011	1		
(18) Dividend yield	−0.043*	−0.057*	0.176*	0.155*	0.148*	−0.070*	−0.011	1	
(19) Cash (% Assets)	0.005	0.030*	0.179*	−0.090*	0.136*	0.106*	0.032*	−0.046*	1

The two- and three-year betas represent each stock's sensitivity to market movements over weekly two- and three-year periods, while the five-year beta is similarly calculated but over a monthly five-year window. IO represents the percentage of outstanding shares owned by institutional investors (e.g. mutual funds and ETFs). FF represents the percentage of outstanding shares available for trading after deducting insiders' shares and other strategic blockholders. The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. * indicates significance at the 10% level.

set of firms that are heavily dominated by institutions. By contrast, FF is high on average (mean ≈61%, p50 ≈ 72%) and much less skewed: the interquartile range spans approximately 30%–98%. Thus, while most firms have a sizable pool of tradable shares, only some attract material institutional stakes.

With respect to the econometric model, the baseline results are presented in Table 3. The findings indicate that both tradability and actual institutional presence affect unconditional market risk, although their influence varies depending on the horizon over which beta is measured. IO is uniformly positive and highly significant. Across all three beta windows, the IO coefficients range between 0.0004 and 0.0054. Economically, this means that moving IO up by 10% points raises the unconditional beta by approximately 0.004–0.05 – non-trivial given the median five-year beta of 1.00 (Table 1). The point estimate is the largest for the two-year horizon (columns 7 and 9), suggesting that flow-driven risk is the strongest in the shorter, weekly-based beta series.

Additionally, FF enters positively but is less robust. In the five-year regression, FF has a coefficient of 0.0013 (column 2), which is significant at the 1% level. Therefore, a one-standard-deviation increase in float (≈30% points) adds about 0.04 to beta. The effect persists, although at a smaller magnitude, for three-year betas (0.0005, column 5). In the two-year specification, FF is only highly significant when IO is omitted (column 8). Once IO is added (column 9), its coefficient shrinks to 0.0004 and loses significance, implying that the marginal contribution of the float is captured by institutional positions for the shortest horizon.

Collectively, these positive coefficients indicate that both IO and FF exacerbate, rather than reduce, systematic risk. The positive and significant associations between IO, FF, and market betas (unconditional, upside, and downside) are consistent with

Table 3. Institutional ownership, free float, and unconditional five-, three- and two-year betas.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	5-year Beta	5-year Beta	5-year Beta	3-year Beta	3-year Beta	3-year Beta	2-year Beta	2-year Beta	2-year Beta
IO (%)	0.0044***		0.0043***	0.0006***		0.0004**	0.0054***		0.0053***
	(0.0003)		(0.0003)	(0.0002)		(0.0002)	(0.0003)		(0.0003)
FF (%)		0.0013***	0.0007**		0.0005***	0.0005***		0.0014***	0.0004*
		(0.0003)	(0.0003)		(0.0001)	(0.0001)		(0.0002)	(0.0002)
M/B	−0.0069***	−0.0067***	−0.0069***	0.0104***	0.0103***	0.0103***	0.0059***	0.0056***	0.0059***
	(0.0021)	(0.0021)	(0.0021)	(0.0015)	(0.0015)	(0.0015)	(0.0018)	(0.0019)	(0.0018)
Assets (log)	−0.0261***	−0.0289***	−0.0284***	0.0566***	0.0550***	0.0554***	0.0110***	0.0085**	0.0097**
	(0.0041)	(0.0043)	(0.0042)	(0.0029)	(0.0029)	(0.0030)	(0.0038)	(0.0040)	(0.0039)
ROA	−0.0080***	−0.0072***	−0.0079***	−0.0129***	−0.0128***	−0.0129***	−0.0124***	−0.0111***	−0.0123***
	(0.0011)	(0.0011)	(0.0011)	(0.0008)	(0.0008)	(0.0008)	(0.0010)	(0.0010)	(0.0010)
Quick ratio	−0.0050	−0.0049	−0.0046	0.0205***	0.0205***	0.0205***	0.0125**	0.0126**	0.0127**
	(0.0059)	(0.0060)	(0.0059)	(0.0042)	(0.0042)	(0.0042)	(0.0051)	(0.0052)	(0.0051)
Debt-to-equity	0.0003***	0.0003***	0.0003***	−0.0003***	−0.0003***	−0.0003***	−0.0003***	−0.0003***	−0.0003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Company age	−0.0513***	−0.0599***	−0.0513***	−0.0764***	−0.0776***	−0.0768***	−0.0687***	−0.0782***	−0.0691***
	(0.0093)	(0.0094)	(0.0093)	(0.0063)	(0.0063)	(0.0063)	(0.0081)	(0.0081)	(0.0081)
Dividend yield	−0.0009*	−0.0013	−0.0009*	−0.0000	−0.0000	−0.0000	−0.0053***	−0.0076***	−0.0054***
	(0.0005)	(0.0008)	(0.0006)	(0.0000)	(0.0000)	(0.0000)	(0.0010)	(0.0012)	(0.0010)
Cash-to-assets	0.1221	0.1160	0.1140	0.2812***	0.2783***	0.2781***	0.2144***	0.2105***	0.2101***
	(0.0781)	(0.0776)	(0.0782)	(0.0515)	(0.0517)	(0.0517)	(0.0620)	(0.0623)	(0.0620)
Constant	1.2662***	1.3119***	1.2970***	−0.4769***	−0.4519***	−0.4612***	0.5843***	0.6396***	0.6014***
	(0.1153)	(0.1186)	(0.1162)	(0.0877)	(0.0876)	(0.0879)	(0.1108)	(0.1140)	(0.1111)
Sector fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	9,314	9,314	9,314	12,050	12,048	12,048	9,954	9,954	9,954
Adj R-squared	0.173	0.154	0.174	0.219	0.220	0.220	0.179	0.143	0.180

This table presents the baseline OLS regression results for the association between institutional ownership (IO), free float (FF), and the unconditional five-, three-, and two-year betas. The first three columns show the overall five-year beta as the dependent variable, next three columns show the three-year beta, and last three columns show the two-year beta. The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. Robust standard errors are indicated in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 4. Institutional ownership, free float, and five-year asymmetric betas.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	5-year Beta-	5-year Beta+	5-year Beta-	5-year Beta+	5-year Beta-	5-year Beta+
IO (%)	0.0008**	0.0022***			0.0005	0.0021***
	(0.0004)	(0.0003)			(0.0004)	(0.0004)
FF (%)			0.0009***	0.0007***	0.0008***	0.0002
			(0.0002)	(0.0003)	(0.0003)	(0.0003)
M/B	−0.0192***	−0.0033	−0.0191***	−0.0026	−0.0193***	−0.0033
	(0.0034)	(0.0033)	(0.0034)	(0.0033)	(0.0034)	(0.0033)
Assets (log)	−0.0464***	0.0237***	−0.0495***	0.0222***	−0.0493***	0.0228***
	(0.0055)	(0.0061)	(0.0057)	(0.0062)	(0.0057)	(0.0062)
ROA	−0.0037**	−0.0159***	−0.0037**	−0.0160***	−0.0037**	−0.0159***
	(0.0018)	(0.0019)	(0.0018)	(0.0019)	(0.0018)	(0.0019)
Quick Ratio	0.0098	0.0247**	0.0106	0.0284***	0.0098	0.0249**
	(0.0098)	(0.0097)	(0.0099)	(0.0097)	(0.0099)	(0.0097)
Debt-to-equity	0.0009***	0.0004***	0.0009***	0.0004***	0.0009***	0.0004***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Company Age	0.0338**	−0.0417***	0.0314**	−0.0503***	0.0332**	−0.0419***
	(0.0144)	(0.0144)	(0.0144)	(0.0144)	(0.0144)	(0.0144)
Dividend Yield	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Cash-to-assets	−0.3707***	0.0829	−0.3794***	0.0939	−0.3839***	0.0736
	(0.1433)	(0.1313)	(0.1442)	(0.1319)	(0.1442)	(0.1319)
Constant	2.5275***	1.2840***	2.5558***	1.3335***	2.5460***	1.2900***
	(0.1668)	(0.1832)	(0.1657)	(0.1824)	(0.1667)	(0.1834)
Sector fixed effects	Y	Y	Y	Y	Y	Y
Country effects	Y	Y	Y	Y	Y	Y
Observations	12,132	12,159	12,130	12,157	12,130	12,157
Adj R-squared	0.109	0.0813	0.109	0.0791	0.110	0.0813

This table presents the baseline OLS regression results for the association between institutional ownership (IO), free float (FF) and the 5-year β^{-} (columns 1, 3, and 5) and 5-year β^{+} (columns 2, 4, and 6). The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. Robust standard errors are indicated in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

the trading flow (fragility) view in GT and with studies suggesting that greater institutional presence increases systematic risk (Faias and Ferreira 2017; Jylhä, Suominen, and Tomunen 2023) and with the float literature linking higher FF to greater volatility and priced risk (Bostanci and Kilic 2010; Zhang, Tian, and Wirjanto 2009).

Table 4 probes whether the ownership channels identified in the baseline regressions operate symmetrically in down- versus up-markets by replacing unconditional beta with the five-year downside (β^{-}) and upside (β^{+}) betas. The results show that IO raises both kinds of market exposure; however, its marginal impact is almost twice as large for upside risk, whereas FF mainly amplifies downside risk. Columns 1 and 2 include only IO. A one-percentage-point increase in IO adds 0.0010 to β– but 0.0022 to β+, both highly significant at the 1% level. Specifically, heavily institutionally owned stocks participate more strongly in market rallies than in crashes. Columns 3 and 4 replace IO with FF. FF enters positively in both regimes (0.0009 for β– and 0.0007 for β+) but the coefficient on β– is the larger of the two, indicating that a wide tradable float primarily heightens sensitivity to negative market moves. Columns 5 and 6 include IO and FF simultaneously. The IO effect remains strong, still 0.0021 for β+ and statistically non-significant (0.0005) for β-, while the FF coefficient stays positive and highly significant for β- (0.0008) but reduces to a non-significant 0.0002 for β+. In sum, tradability (FF) matters for downside risk even after conditioning on ownership, whereas institutional concentration (IO) dominates on the upside and absorbs the float effect.

Table 5. IV regressions of institutional ownership, free float, and five-year betas.

Variables	(1) 5-year Beta Uncond.	(2) 5-year Beta Uncond.	(3) 5-year Beta-	(4) 5-year Beta-	(5) 5-year Beta+	(6) 5-year Beta+
IO (%)	0.0020***		0.0057***		0.0068***	
	(0.0007)		(0.0012)		(0.0013)	
FF (%)		0.0016***		0.0046***		0.0055***
		(0.0006)		(0.0010)		(0.0010)
M/B	−0.0059***	−0.0049**	−0.0201***	−0.0172***	−0.0062	−0.0028
	(0.0021)	(0.0021)	(0.0037)	(0.0036)	(0.0038)	(0.0037)
Assets (log)	−0.0381***	−0.0419***	−0.0522***	−0.0632***	0.0211***	0.0078
	(0.0039)	(0.0046)	(0.0063)	(0.0074)	(0.0070)	(0.0081)
ROA	−0.0067***	−0.0066***	−0.0037*	−0.0033*	−0.0120***	−0.0116***
	(0.0011)	(0.0011)	(0.0020)	(0.0020)	(0.0022)	(0.0022)
Quick ratio	−0.0098	−0.0057	0.0090	0.0208*	0.0134	0.0276***
	(0.0061)	(0.0059)	(0.0112)	(0.0111)	(0.0110)	(0.0105)
Debt-to-equity	0.0003***	0.0003***	0.0009***	0.0009***	0.0005***	0.0005***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Company age	−0.0487***	−0.0569***	0.0249	0.0015	−0.0443***	−0.0723***
	(0.0094)	(0.0087)	(0.0155)	(0.0148)	(0.0170)	(0.0160)
Dividend yield	−0.0010*	−0.0012*	0.0011***	0.0004	−0.0008**	−0.0016
	(0.0005)	(0.0007)	(0.0003)	(0.0007)	(0.0004)	(0.0011)
Cash-to-assets	−0.0024	−0.0049	−0.4049**	−0.4116**	0.0522	0.0430
	(0.0766)	(0.0767)	(0.1662)	(0.1649)	(0.1474)	(0.1474)
Constant	2.2095***	2.2343***	2.6377***	2.7091***	1.3547***	1.4396***
	(0.1089)	(0.1100)	(0.1745)	(0.1745)	(0.2077)	(0.2070)
Sector fixed effects	Y	Y	Y	Y	Y	Y
Observations	9,314	9,314	9,300	9,300	9,303	9,303
R-squared	0.151	0.144	0.114	0.121	0.0913	0.094
Adj R-squared	0.144	0.137	0.106	0.113	0.0832	0.0860
Wald χ2	1673	1645	1519	1544	1045	1019
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J Stat	.157178	.335421	1.06274	1.94806	.470823	1.00695
p-value	0.6918	0.5625	0.3026	0.1628	0.4926	0.3156

This table presents the instrumental variables (2SLS) regression results for the association between institutional ownership (IO), free float (FF), and the unconditional five-year β, five-year β^{-}, and five-year β^{+}. The instruments used are the World Bank Doing Business ranking of the country and a dummy variable that equals 1 if the stock is included in the MSCI World Index. Both IO and FF are instrumented using these variables. The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. Robust standard errors are indicated in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 5 reports two-stage least squares (2SLS) estimates that treat IO and FF as endogenous. Both variables are instrumented with (i) the World Bank Doing Business rank of the firm's home country (a proxy for investor-protection quality) and (ii) a dummy that equals 1 when the stock is included in the MSCI World Index (an exogenous source of index-fund demand). Sector dummies and the full set of firm-level controls are retained. The first-stage Wald χ^2 statistics exceed 1000, and Hansen J p-values range from 0.16 to 0.69; therefore, the instruments are strong and accepted as over-identifying.

The core finding survives instrumentation: IO and FF remain positive and highly significant across the unconditional, downside, and upside betas. Consistent with the OLS results, the causal impact of IO is largest for the upside beta. However, for FF, the IV estimates show a stronger association with β^+ than with β^-, whereas the OLS pattern is the reverse; therefore, additional empirical work is required to determine whether tradability amplifies downside or upside risk more strongly.

VI. Heterogeneity and robustness tests

Baseline estimates may be influenced by heterogeneity across countries and firms because institutional presence, market development, and firm size can condition the extent to which ownership and tradability channels shape systematic risk. To address this concern, I conduct additional analyses along three dimensions – the United States versus the rest of the world, advanced versus emerging economies, and larger versus smaller capitalization firms – while retaining the same specifications and set of controls.

The results indicate that FF exerts a consistently positive and statistically significant effect across all partitions, confirming the robustness of the synchronization channel irrespective of geography, development status, or size. In contrast, the effect of IO is non-universal. IO remains economically and statistically significant in the United States and

Table 6. Institutional ownership, free float, and beta: U.S.A. versus other countries.

	Excluding USA		USA only	
	(1)	(2)	(3)	(4)
Variables	5-year Beta	5-year Beta	5-year Beta	5-year Beta
IO (%)	0.0001		0.0050***	
	(0.0007)		(0.0004)	
FF (%)		0.0011***		0.0021**
		(0.0003)		(0.0008)
M/B	−0.0040	−0.0041	−0.0110***	−0.0105***
	(0.0026)	(0.0026)	(0.0036)	(0.0038)
Assets (log)	−0.0113**	−0.0155***	−0.0545***	−0.0588***
	(0.0048)	(0.0049)	(0.0086)	(0.0094)
ROA	−0.0045***	−0.0044***	−0.0151***	−0.0117***
	(0.0014)	(0.0014)	(0.0020)	(0.0021)
Quick ratio	−0.0042	−0.0036	−0.0156	−0.0149
	(0.0069)	(0.0069)	(0.0135)	(0.0138)
Debt-to-equity	0.0001	0.0001	0.0007***	0.0007***
	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Company age	−0.0415***	−0.0409***	−0.0521***	−0.0729***
	(0.0108)	(0.0108)	(0.0178)	(0.0182)
Dividend yield	−0.0006***	−0.0006**	−0.0053**	−0.0095**
	(0.0002)	(0.0002)	(0.0026)	(0.0038)
Cash-to-assets	0.1264	0.1090	0.0705	0.0078
	(0.0952)	(0.0953)	(0.1370)	(0.1360)
Constant	0.9975***	1.0547***	2.2394***	2.5138***
	(0.1378)	(0.1386)	(0.2254)	(0.2363)
Sector fixed effects	Y	Y	Y	Y
Country fixed effects	Y	Y	Y	Y
Observations	6,879	6,879	2,435	2,435
Adj R-squared	0.144	0.146	0.285	0.230

This table presents the baseline OLS regression results for the association between institutional ownership (IO), free float (FF), and unconditional beta (five-year β). The first two columns show the results for all countries except the U.S.A., and the next two columns show the results for the U.S.A. only. The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. Robust standard errors are indicated in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

advanced economies; however, its influence is absent in the rest of the world and emerging markets. When the sample is partitioned by firm size, IO is significant for both large- and small-cap firms but the effect is stronger for the former. These findings support the interpretation that the tradability channel operates globally, whereas the risk concentration channel requires sufficiently deep and sophisticated institutional investor ecosystems.

Table 6 highlights the geographic asymmetry. IO exhibits a strong association with beta for U.S. firms, with a coefficient of approximately 0.005, implying that a 10-percentage-point increase in institutional stake raises beta by 0.05. However, outside the United States, the effect vanishes, with IO being statistically indistinguishable from 0. In both subsamples, FF remains robust, with increments in beta of 0.021 in the United States and 0.011 elsewhere for the same 10-percentage-point increase in float. These results indicate that institutional flows amplify covariance in markets in which institutional intermediation and benchmark-constrained trading are pervasive (Greenwood and Thesmar 2011), whereas the float-induced synchronization of trades operates independently of the market structure.

The comparison between the developed and emerging economies in Table 7 reinforces this conclusion. In advanced markets, IO is significant (coefficient ≈0.0044), while in emerging economies the estimate is indistinguishable from 0. In contrast, FF is positive in both settings, with stronger effects in developed markets (≈0.0018) but remains significant in emerging markets (≈0.0008). These patterns confirm that IO requires depth of institutional participation and correlated mandates to translate into systematic covariance, whereas the FF channel functions more broadly by facilitating synchronous trading across investors, even when institutions are less prominent or disclosure

Table 7. Institutional ownership, free float, and beta: developed countries versus emerging markets.

	Developed countries		Emerging markets	
	(1)	(2)	(3)	(4)
Variables	5-year Beta	5-year Beta	5-year Beta	5-year Beta
IO (%)	0.0044***		−0.0003	
	(0.0003)		(0.0013)	
FF (%)		0.0018***		0.0008*
		(0.0003)		(0.0004)
M/B	−0.0091***	−0.0087***	0.0005	0.0005
	(0.0026)	(0.0026)	(0.0037)	(0.0037)
Assets (log)	−0.0278***	−0.0323***	−0.0057	−0.0073
	(0.0048)	(0.0051)	(0.0083)	(0.0083)
ROA	−0.0100***	−0.0087***	−0.0026	−0.0024
	(0.0013)	(0.0013)	(0.0022)	(0.0022)
Quick ratio	−0.0142*	−0.0137*	0.0035	0.0042
	(0.0076)	(0.0077)	(0.0093)	(0.0093)
Debt-to-equity	0.0003***	0.0004***	0.0003**	0.0003**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Company age	−0.0549***	−0.0650***	−0.0363*	−0.0358*
	(0.0104)	(0.0105)	(0.0202)	(0.0202)
Dividend yield	−0.0046***	−0.0069***	−0.0005***	−0.0004***
	(0.0013)	(0.0017)	(0.0001)	(0.0001)
Cash-to-assets	0.2286**	0.2016**	−0.3440**	−0.3705**
	(0.0887)	(0.0881)	(0.1686)	(0.1664)
Constant	2.0852***	2.0645***	1.1029***	1.1224***
	(0.1337)	(0.1373)	(0.2081)	(0.2086)
Sector fixed effects	Y	Y	Y	Y
Country fixed effects	Y	Y	Y	Y
Observations	6,224	6,224	3,090	3,090
Adj R-squared	0.235	0.212	0.0901	0.0913

This table presents the baseline OLS regression results for the association between institutional ownership (IO), free float (FF), and unconditional beta (five-year β). The first and next two columns show the results for developed countries and emerging markets, respectively. The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. Robust standard errors are indicated in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 8. Institutional ownership, free float, and beta: large- versus small-cap companies.

	Large-cap firms		Small-cap firms	
	(1)	(2)	(3)	(4)
Variables	5-year Beta	5-year Beta	5-year Beta	5-year Beta
IO (%)	0.0057***		0.0019***	
	(0.0004)		(0.0006)	
FF (%)		0.0008***		0.0020***
		(0.0003)		(0.0005)
M/B	−0.0067**	−0.0100***	0.0020	0.0030
	(0.0028)	(0.0028)	(0.0038)	(0.0038)
Assets (log)	−0.0462***	−0.0675***	0.0351***	0.0361***
	(0.0082)	(0.0080)	(0.0105)	(0.0105)
ROA	−0.0039**	−0.0042**	−0.0112***	−0.0105***
	(0.0017)	(0.0017)	(0.0016)	(0.0016)
Quick ratio	0.0028	0.0025	−0.0182**	−0.0175**
	(0.0079)	(0.0081)	(0.0086)	(0.0086)
Debt-to-equity	0.0003***	0.0004***	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Company age	−0.0371***	−0.0533***	−0.0530***	−0.0540***
	(0.0124)	(0.0126)	(0.0135)	(0.0135)
Dividend yield	−0.0011**	−0.0014*	0.0038	0.0025
	(0.0005)	(0.0008)	(0.0040)	(0.0039)
Cash-to-assets	0.0025	0.1008	0.1611	0.1348
	(0.1240)	(0.1213)	(0.0999)	(0.0992)
Constant	2.1140***	2.5686***	0.0167	−0.0385
	(0.2569)	(0.2575)	(0.2431)	(0.2421)
Sector fixed effects	Y	Y	Y	Y
Country fixed effects	Y	Y	Y	Y
Observations	4,700	4,700	4,614	4,614
Adj R-squared	0.235	0.185	0.158	0.160

This table presents the baseline OLS regression results for the association between institutional ownership (IO), free float (FF), and unconditional beta (five-year β). The first and next two columns show the results for firms above and below the median market capitalization, respectively. The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. Robust standard errors are indicated in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

standards are weaker (Ben-David, Franzoni, and Moussawi 2018).

Partitioning the sample by firm size in Table 8 reveals that the main results hold for both large- and small-cap segments. IO is statistically significant in both groups, with a larger magnitude among large-cap firms (≈0.0057) compared with small-cap firms (≈0.0019). FF remains significant across both partitions, although the effect is stronger for small-cap firms (≈0.0020 versus ≈0.0008 for large-cap firms). These findings suggest that for large-cap firms, already heavily embedded in institutional portfolios, marginal increases in IO scale the amount of capital exposed to correlated flows, whereas for small-cap firms, increases in float broaden the set of investors able to transact simultaneously, enhancing synchronization effects.

Table 9 extends the baseline specification by introducing interaction terms between IO and FF. Across all models, the coefficients of IO and FF remain positive and statistically significant, which is broadly consistent with the earlier results. However, the interaction term is either statistically non-significant or economically negligible in two of the three specifications; although weakly significant in column (2), the estimated magnitude is close to 0. This suggests that the effects of IO and FF on systematic risk are largely additive rather than mutually reinforcing. The robust interaction effect may be absent, given the relatively high correlation between IO and FF (0.343), raising concerns about multi-collinearity. These results indicate that, while both ownership concentration and tradability independently contribute to higher betas, their joint effect does not provide additional explanatory power beyond the sum of their separate influences. From a market stability perspective, this implies that higher IO and greater FF each erode stability by raising systematic risk but their combination does not generate a disproportionate, non-linear increase in fragility.

The robustness tests in Tables 6–9 refine the interpretation of the baseline evidence. FF emerges

Table 9. Institutional ownership, free float, and beta: interaction effects.

Variables	(1) 5-year beta	(2) 5-year beta	(3) 5-year beta
IO (%)	0.0055***		0.0062***
	(0.0021)		(0.0022)
FF (%)		0.0006**	0.0007**
		(0.0003)	(0.0003)
IO×FF	0.0000	0.0000***	0.0000
	(0.0000)	(0.0000)	(0.0000)
M/B	−0.0068***	−0.0071***	−0.0068***
	(0.0021)	(0.0021)	(0.0021)
Assets (log)	−0.0258***	−0.0292***	−0.0280***
	(0.0042)	(0.0042)	(0.0043)
ROA	−0.0080***	−0.0079***	−0.0079***
	(0.0011)	(0.0011)	(0.0011)
Quick ratio	−0.0050	−0.0048	−0.0046
	(0.0059)	(0.0059)	(0.0059)
Debt-to-equity	0.0003***	0.0003***	0.0003***
	(0.0001)	(0.0001)	(0.0001)
Company age	−0.0508***	−0.0536***	−0.0504***
	(0.0093)	(0.0093)	(0.0093)
Dividend yield	−0.0009*	−0.0010*	−0.0009*
	(0.0005)	(0.0006)	(0.0006)
Cash-to-assets	0.1223	0.1146	0.1138
	(0.0782)	(0.0781)	(0.0782)
Constant	1.2595***	1.3173***	1.2877***
	(0.1163)	(0.1162)	(0.1169)
Sector fixed effects	Y	Y	Y
Country fixed effects	Y	Y	Y
Observations	9,314	9,314	9,314
Adj R-squared	0.173	0.173	0.174

This table presents the baseline OLS regression results for the association between institutional ownership (IO), free float (FF), interaction between IO and FF, and unconditional beta (five-year β). The M/B ratio is the ratio of a firm's market value to its book value. Assets (log) are the natural logarithms of a firm's book value. ROA (return on assets) measures a company's profitability relative to total assets. The quick ratio assesses a company's short-term liquidity. The dividend yield is the expected yearly dividend per share divided by the share price. The debt-to-equity ratio measures the leverage. Company age (log) is the natural logarithm of company age. Cash (% of assets) is the proportion of total assets held as cash. Robust standard errors are indicated in the parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

as a globally relevant determinant of systematic risk, consistent with its role in broadening the eligibility for index funds, ETFs, and benchmark-constrained strategies. However, IO raises systematic risk only when institutional ecosystems are sufficiently dense, as in the United States and other advanced markets. These results highlight the importance of considering market structure when assessing how ownership composition and tradability shape the transmission of systematic risk, reinforcing the relevance of both channels within GT's fragility framework while clarifying the conditions under which each is operative.

Although these additional regressions are not reported, several additional robustness checks are performed. Specifically, the baseline specifications are re-estimated after excluding firms with high IO using alternative cut-offs of 90% and 80% and after excluding all observations belonging to the three largest sectors in the sample by firm count. All regressions continue to include sector fixed effects. Across these alternative samples, the estimated coefficients of IO and FF remain positive and statistically significant, which is in line with the baseline results.

VII. Conclusions, limitations, policy implications, and avenues for future research

Across a global cross-section of listed firms, this study documents that IO and FF are the additive determinants of systematic risk. Both are positively associated with the CAPM beta after controlling for standard fundamentals. Moreover, evidence clarifies how these channels operate. IO is most strongly linked to up-market exposure (β^{+}), consistent with the idea that correlated institutional trading amplifies participation in market-wide rallies, while FF is more robustly linked to down-market exposure (β^{-}), consistent with tradable supply

facilitating synchronized selling pressure when market conditions deteriorate. Importantly, interaction tests indicate limited non-linearity; the joint effect is largely the sum of two distinct mechanisms rather than a disproportionate amplification.

Cross-country splits show that the IO channel is concentrated in advanced markets (especially in the U.S.), whereas the FF channel remains visible across geographies and firm size segments. This pattern is consistent with the interpretation that IO-driven fragility requires a sufficiently dense institutional ecosystem and correlated mandates to transmit common flows into covariance, whereas FF operate broadly by enlarging the tradable inventory that accommodates synchronized trading. Instrumental variable estimates corroborate the overall positive effects while suggesting that the relative strength of FF across β^+ and β^- depends on identification and market structure, motivating further study using panel designs and quasi-experimental float or index-demand shocks.

This study has several limitations. First, it is based on a cross-sectional framework using a December 2023 snapshot and five-, three-, and two-year betas. Although it addresses endogeneity concerns with 2SLS and tests multiple horizons, a panel-data approach can exploit within-firm variation and provide stronger identification through time and firm fixed effects, dynamic specifications, or event-study designs around plausibly exogenous shocks such as index reconstitutions or lock-up expirations. This extension will reinforce the robustness and causal interpretation of the results. Second, it does not explicate heterogeneity within IO. Owing to data limitations, it cannot distinguish between investor types, such as ETFs, mutual funds, pension funds, hedge funds, sovereign wealth vehicles, or between domestic and foreign institutions. As these categories differ in their trading mandates, liquidity needs, and disclosure requirements, future research disaggregating IO can offer more granular insights into the mechanisms linking ownership and systematic risk. Third, the coverage of institutional holdings in emerging markets is limited. Many firms in this dataset report zero IO, reflecting low participation and weaker disclosure standards. This limitation implies that this study's estimates for emerging markets should be interpreted with caution. Future work should draw on local filings, broaden data sources, or employ econometric methods to address potential measurement errors and under-reporting. Moreover, although this study focuses on systematic risk, it does not examine total risk (return variance), downside total risk (semi-variance), or tail-risk measures, such as value-at-risk or expected shortfall. Extending the analysis to these dimensions, along with option-implied and high-frequency betas, can clarify whether the effects of IO and FF are confined to covariance with the market or extend to broader volatility and tail-risk dynamics. Another open dimension concerns cross-country differences in market structure. Although the empirical specification absorbs some of this heterogeneity through country and sector effects, this study does not directly model how variations in liquidity, transparency, trading frictions, or disclosure regimes shape the ownership – risk relationship. Future work should combine the ownership and FF measures used here with richer market structure indicators to assess whether high-IO and high-FF configurations are more destabilizing in thin, opaque markets than in deep, transparent ones.

The findings of this study have important policy implications. Its cross-country evidence shows that both IO and FF systematically increase firms' market betas, indicating that trading flow dynamics transmit risk beyond fundamentals. This is important for regulators, exchanges, index providers, investors, and researchers. From a regulatory perspective, these results indicate the design of disclosure standards for institutional holdings and FF, monitoring of institutional investors as potential amplifiers of market-wide shocks, and calibration of market liquidity frameworks that can offset flow-induced fragility. For supervisors and macro-prudential authorities, systematic monitoring of high-IO and high-FF firms should form part of risk dashboards and stress tests since such stocks are especially sensitive to common flows. Where float is extensive, measures enhancing market resilience, such as volatility interruptions or liquidity provisions, are particularly relevant, and better disclosure of institutional holdings and harmonized float statistics will aid in the early detection of vulnerabilities. For exchanges and index providers, index design and rebalancing rules can either amplify or mitigate the correlated trading pressure. Wider buffers, staggered implementation dates, and turnover sensitive weighting can reduce order imbalances in

firms characterized by both high IO and extensive FF. For investors, IO and FF should be explicitly incorporated into portfolio risk management. This includes screening securities on these dimensions, diversifying across ownership and float profiles, stress-testing portfolio betas against flow shocks (e.g. index rebalances or ETF flows), and strengthening downside risk controls when exposure to high-FF firms is material. For researchers, promising extensions include applying the framework to other asset-pricing contexts (multi-factor models, option-implied or high-frequency betas, credit, or REITs) and incorporating behavioural aspects of institutional trading, such as herding or attention shocks, to capture potential non-linearities and heterogeneity. Finally, this study's heterogeneity analysis shows that IO effects are concentrated in advanced economies, whereas FF effects operate across all markets. This suggests that regulatory emphasis should differ by context; however, that joint surveillance of IO and FF is warranted in all jurisdictions, given their additive impact on systematic risk.

While this study's theoretical framework is intentionally anchored in GT's fragility model, which emphasizes the synchronous behaviour of institutional investors and limited depth of tradable liquidity captured by FFs, this study's findings are connected to broader strands of theory that has not been formally developed here. In particular, the behavioural finance and information asymmetry perspectives may shape how institutions process information and adjust their portfolios, influencing the strength and timing of the fragility channel. Likewise, agency theory, market micro-structure models of trading frictions and inventory risk, and the investor herding literature offer complementary mechanisms through which IO and FF can affect the propagation of market-wide shocks. Exploring these links in a unified framework is beyond the scope of this study. However, by embedding the Greenwood – Thesmar mechanism in richer models of institutional decision-making, trading behaviour, and informational frictions, this study represents a promising avenue for future research.

Author contributions

CRediT: **Paulo Morais Francisco:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Writing – original draft, Writing – review & editing.

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Data availability statement

Data were obtained under licence from Refinitiv Eikon and cannot be shared publicly. They are available from the author, with Refinitiv's permission, upon reasonable request.

References

Acharya, V. V., and L. H. Pedersen. 2005. "Asset Pricing with Liquidity Risk." *Journal of Financial Economics* 77 (2): 375–410. https://doi.org/10.1016/j.jfineco.2004.06.007.

Admati, A. R., and P. Pfleiderer. 1988. "A Theory of Intraday Patterns: Volume and Price Variability." *Review of Financial Studies* 1 (1): 3–40. https://doi.org/10.1093/rfs/1.1.3.

Amihud, Y., and H. Mendelson. 1986. "Asset Pricing and the Bid–Ask Spread." *Journal of Financial Economics* 17 (2): 223–249. https://doi.org/10.1016/0304-405X(86)90065-6.

Ang, A., J. Chen, and Y. Xing. 2006. "Downside Risk." *The Review of Financial Studies* 19 (4): 1191–1239. https://doi.org/10.1093/rfs/hhj035.

Barberis, N., and A. Shleifer. 2003. "Style Investing." *Journal of Financial Economics* 68 (2): 161–199. https://doi.org/10.1016/S0304-405X(03)00064-3.

Barberis, N., and A. Shleifer. 2005. "Investment Style and Asset Allocation." *Journal of Econometrics* 121 (1–2): 1–49.

Ben-David, I., F. A. Franzoni, and R. Moussawi. 2018. "Do ETFs Increase Volatility?" *The Journal of Finance* 73 (6): 2471–2535. https://doi.org/10.1111/jofi.12727.

Bostanci, F., and S. Kilic. 2010. "The Effects of Free Float Ratios on Market Performance: An Empirical Study on the Istanbul Stock Exchange." *Istanbul Stock Exchange Review, Research and Business Development Department, Borsa Istanbul* 12 (45): 1–14.

Bradrania, R., R. Elliott, and W. Wu. 2022. "Institutional Ownership and Liquidity Commonality: Evidence from Australia." *Accounting & Finance* 62 (S1): 1231–1272. https://doi.org/10.1111/acfi.12822.

Chen, X. 2025. "Common Institutional Ownership and Commonality in Liquidity: Evidence from China." *Accounting & Finance* 65 (2): 1635–1668. https://doi.org/10.1111/acfi.13380.

Chordia, T., R. Roll, and A. Subrahmanyam. 2000. "Commonality in Liquidity." *Journal of Financial Economics* 56 (1): 3–28. https://doi.org/10.1016/S0304-405X(99)00057-4.

De George, E. T., N. Reiter, C. Synn, and C. D. Williams. 2019. "Institutional Ownership and the Propagation of Systemic Risk Among Banks." Working Paper, Toronto, Canada: University of Toronto, Rotman School of Management.

Dinh, N. B., and V. N. H. Tran. 2024. "Institutional Ownership and Stock Liquidity: Evidence from an Emerging Market." *SAGE Open* 14 (1). https://doi.org/10.1177/21582440241239116.

Estrada, J. 2002. "Systematic Risk in Emerging Markets: The D-CAPM." *Emerging Markets Review* 3 (4): 365–379. https://doi.org/10.1016/S1566-0141(02)00042-0.

Estrada, J. 2007. "Mean-Semivariance Behavior: Downside Risk and Capital Asset Pricing." *International Review of Economics and Finance* 16 (2): 169–185. https://doi.org/10.1016/j.iref.2005.03.003.

Eugster, N., and Q. Wang. 2023. "Large Blockholders and Stock Price Crash Risk: An International Study." *Global Finance Journal* 55:100799. https://doi.org/10.1016/j.gfj.2022.100799.

Faias, J. A., and M. A. Ferreira. 2017. "Does Institutional Ownership Matter for International Stock Return Comovement?" *Journal of International Money and Finance* 78:64–83. https://doi.org/10.1016/j.jimonfin.2017.08.004.

Field, L. C., and G. R. Hanka. 2001. "The Expiration of IPO Share Lockups." *Journal of Finance* 56 (2): 471–500. https://doi.org/10.1111/0022-1082.00334.

Francisco, P. M. 2025. "Labour Intensity and Systematic Risk." *Finance Research Letters* 86:108475. https://doi.org/10.1016/j.frl.2025.108475.

Greenwood, R., and D. Thesmar. 2011. "Stock Price Fragility." *Journal of Financial Economics* 102 (3): 471–490. https://doi.org/10.1016/j.jfineco.2011.06.003.

Insana, A. 2022. "Does Systematic Risk Change When Markets Close? An Analysis Using Stocks' Beta." *Economic Modelling* 109:105782. https://doi.org/10.1016/j.econmod.2022.105782.

Jankensgård, H., and A. Vilhelmsson. 2018. "The Shareholder Base Hypothesis of Stock Return Volatility: Empirical Evidence." *Financial Management* 47 (1): 55–79.

Jha, R. K., and R. K. Tiwari. 2025. "Institutional Ownership and Corporate Risk-Taking: Indian Evidence." *Global Business Review*. https://doi.org/10.1177/09721509241310035.

Jylhä, P., M. Suominen, and T. Tomunen. 2023. "Beta Bubbles." *Journal of Financial Economics* 149 (2): 360–387.

Kogan, L., J. Li, and H. Zhang. 2023. "Operating Hedge and the Gross-Profitability Premium." *Journal of Finance* 78 (6): 3387–3422.

Kyle, A. S. 1985. "Continuous Auctions and Insider Trading." *Econometrica* 53 (6): 1315–1335. https://doi.org/10.2307/1913210.

Li, X., J. Hao, and L. Liu. 2025. "Does Common Institutional Ownership Affect Systemic Risk of Non-Financial Firms? Evidence from China." *Economic Analysis and Policy* 87:235–255. https://doi.org/10.1016/j.eap.2025.06.005.

Lintner, J. 1965. "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." *The Review of Economics and Statistics* 47 (1): 13–37. https://doi.org/10.2307/1924119.

Mossin, J. 1966. "Equilibrium in a Capital Asset Market." *Econometrica* 34 (4): 768–783. https://doi.org/10.2307/1910098.

Ofek, E., and M. Richardson. 2003. "DotCom Mania: The Rise and Fall of Internet Stock Prices." *Journal of Finance* 58 (3): 1113–1137. https://doi.org/10.1111/1540-6261.00560.

Pástor, Ľ., and R. F. Stambaugh. 2003. "Liquidity Risk and Expected Stock Returns." *Journal of Political Economy* 111 (3): 642–685. https://doi.org/10.1086/374184.

Pellegrini, C. B., R. Camacci, L. Pellegrini, and A. Roncella. 2023. "Interaction Between Ownership Structure and Systemic Risk in the European Financial Sector." *Corporate Ownership & Control* 20 (3): 232–244. https://doi.org/10.22495/cocv20i3art15.

Roy, S., B. R. Marshall, H. Nguyen, and N. Visaltanachoti. 2025. "Stock Price Crashes and Systematic Risk." *Journal of Contemporary Accounting and Economics* 21 (3): 100509. https://doi.org/10.1016/j.jcae.2025.100509.

Saghi, N., Z. Srour, J.-L. Viviani, and M. Jezzini. 2023. "Systemic Risk in European Banks: Does Ownership Structure Matter?" *Quarterly Review of Economics and Finance* 92:88–111. https://doi.org/10.1016/j.qref.2023.07.009.

Scharfstein, D. S., and J. C. Stein. 1990. "Herd Behavior and Investment." *American Economic Review* 80 (3): 465–479.

Sharpe, W. F. 1964. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." *Journal of Finance* 19 (3): 425–442. https://doi.org/10.1111/j.1540-6261.1964.tb02865.x.

Shleifer, A. 1986. "Do Demand Curves for Stocks Slope Downward?" *Journal of Finance* 41 (3): 579–590.

Shleifer, A., and R. W. Vishny. 1997. "The Limits of Arbitrage." *Journal of Finance* 52 (1): 35–55. https://doi.org/10.1111/j.1540-6261.1997.tb03807.x.

Sias, R. W. 2004. "Institutional Herding." *Review of Financial Studies* 17 (1): 165–206. https://doi.org/10.1093/rfs/hhg035.

Zhang, F., Y. Tian, and T. S. Wirjanto. 2009. "Empirical Tests of the Float-Adjusted Return Model." *Finance Research Letters* 6 (4): 219–229. https://doi.org/10.1016/j.frl.2009.09.001.

Appendix

Table A1. Distribution of firms by country.

Country	Freq.	Percent	Country	Freq.	Percent	Country	Freq.	Percent
Anguilla	1	0.01	Iceland	7	0.06	Peru	11	0.09
Argentina	101	0.8	India	613	4.84	The Philippines	64	0.51
Australia	1,029	8.13	Indonesia	63	0.5	Poland	25	0.2
Austria	44	0.35	Ireland	65	0.51	Portugal	16	0.13
Azerbaijan	2	0.02	Isle of Man	4	0.03	Puerto Rico	3	0.02
Bahamas	6	0.05	Israel	35	0.28	Qatar	26	0.21
Bahrain	9	0.07	Italy	137	1.08	Romania	3	0.02
Belgium	59	0.47	Japan	600	4.74	Russia	6	0.05
Bermuda	49	0.39	Jersey	15	0.12	Saudi Arabia	40	0.32
Brazil	139	1.1	Jordan	4	0.03	Singapore	101	0.8
British Virgin Islands	53	0.42	Kazakhstan	10	0.08	Slovenia	5	0.04
Bulgaria	1	0.01	Kenya	1	0.01	South Africa	141	1.11
Cambodia	2	0.02	Kuwait	9	0.07	South Korea	45	0.36
Canada	455	3.6	Libya	2	0.02	Spain	91	0.72
The Cayman Islands	25	0.2	Liechtenstein	6	0.05	Sweden	363	2.87
Chile	25	0.2	Luxembourg	40	0.32	Switzerland	235	1.86
China (Mainland)	1,270	10.04	Macau	2	0.02	Taiwan	216	1.71
Colombia	13	0.1	Malaysia	296	2.34	Thailand	412	3.26
Cyprus	15	0.12	Malta	10	0.08	Tunisia	2	0.02
Czech Republic	3	0.02	Mauritius	3	0.02	Turkey	93	0.73
Denmark	91	0.72	Mexico	94	0.74	Unit. Arab Emirates	76	0.6
Egypt	20	0.16	Monaco	2	0.02	The United Kingdom	714	5.64
The Faroe Islands	3	0.02	Mongolia	1	0.01	The United States	3,198	25.27
Finland	95	0.75	Morocco	45	0.36	Uruguay	3	0.02
France	224	1.77	Netherlands	115	0.91	Vietnam	9	0.07
Germany	309	2.44	New Zealand	104	0.82	Zimbabwe	1	0.01
Gibraltar	1	0.01	Nigeria	9	0.07	Unclassified	79	0.62
Greece	22	0.17	Norway	90	0.71	Total	12,655	100
Guernsey	24	0.19	Oman	9	0.07			
Hong Kong	174	1.37	Pakistan	11	0.09			
Hungary	7	0.06	Panama	4	0.03			

Table A2. Distribution of firms by Sector.

Sector	Freq.	Percent	Sector	Freq.	Percent
Aerospace & Defence	114	0.9	Household Products	25	0.2
Air Freight & Logistics	79	0.62	IT Services	164	1.3
Automobile Components	151	1.19	Independent Power and Renewable Elect.	158	1.25
Automobiles	96	0.76	Industrial Conglomerates	126	1
Banks	975	7.7	Industrial REITs	49	0.39
Beverages	130	1.03	Insurance	332	2.62
Biotechnology	433	3.42	Interactive Media & Services	81	0.64
Broadline Retail	93	0.73	Leisure Products	36	0.28
Building Products	115	0.91	Life Sciences Tools & Services	91	0.72
Capital Markets	448	3.54	Machinery	381	3.01
Chemicals	404	3.19	Marine Transportation	49	0.39
Commercial Services & Supplies	125	0.99	Media	228	1.8
Communications Equipment	81	0.64	Metals & Mining	603	4.76
Construction & Engineering	223	1.76	Mortgage Real Estate Investment Trust.	65	0.51
Construction Materials	136	1.07	Multi-utilities	47	0.37
Consumer Finance	124	0.98	Office REITs	62	0.49
Consumer Staples Distribution & Retail	170	1.34	Oil, Gas & Consumable Fuels	408	3.22
Containers & Packaging	83	0.66	Paper & Forest Products	72	0.57
Distributors	24	0.19	Passenger Airlines	71	0.56
Diversified Consumer Services	59	0.47	Personal Care Products	71	0.56
Diversified REITs	60	0.47	Pharmaceuticals	317	2.5
Diversified Telecommunication Services	186	1.47	Professional Services	166	1.31

(*Continued*)

Table A2. (Continued).

Sector	Freq.	Percent	Sector	Freq.	Percent
Electric Utilities	122	0.96	Real Estate Management & Development	395	3.12
Electrical Equipment	183	1.45	Residential REITs	20	0.16
Electronic Equipment, Instruments & C.	279	2.2	Retail REITs	72	0.57
Energy Equipment & Services	113	0.89	Semiconductors & Semiconductor Equipm.	229	1.81
Entertainment	121	0.96	Software	311	2.46
Financial Services	258	2.04	Specialized REITs	46	0.36
Food Products	365	2.88	Specialty Retail	298	2.35
Gas Utilities	62	0.49	Technology Hardware, Storage & Periph.	82	0.65
Ground Transportation	92	0.73	Textiles, Apparel & Luxury Goods	159	1.26
Health Care Equipment & Supplies	249	1.97	Tobacco	21	0.17
Health Care Providers & Services	211	1.67	Trading Companies & Distributors	144	1.14
Health Care REITs	19	0.15	Transportation Infrastructure	128	1.01
Health Care Technology	36	0.28	Water Utilities	45	0.36
Hotel & Resort REITs	21	0.17	Wireless Telecommunication Services	70	0.55
Hotels, Restaurants & Leisure	296	2.34	Unclassified	114	0.9
Household Durables	183	1.45	Total	12,655	100

Table A3. Distribution of firms by country classification.

Country classification	Freq.	Percent
Advanced Economies	8,712	68.84
Emerging Markets	3,943	31.16
Total	12,655	100