The Listing Advantage[1]

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March 2026

Abstract:

Historically, U.S. exchanges dominated the trading in their listings. However, recent rule changes have facilitated listed securities trading on all exchanges. Nevertheless, we find listing exchanges have a substantial advantage in trading their own listings relative to other exchanges. This advantage is economically meaningful (about 13% of market share) and significant regardless of market capitalization, trading activity, liquidity, security type (common stock or ETF), time of day, option-expiration dates, and the listing exchange. Market share migrates on the first day of a listing change. We conclude with ideas for further research to explore this advantage.

JEL Codes: G00, G10, G12, G20

[1] The authors are grateful for comments and assistance from Cindy Alexander, Yakov Amihud, Jim Angel, Paul Barton, Eric Brice, Claude Courbois, Peter Dixon, Erika Frost, Joel Hasbrouck, Terry Hendershott, Jill Henderson, Richard Holley, Qiyu Liu, Jim McLaughlin, Maureen O'Hara, Steve Poser, Burt Porter, Ilia Rainer, Matthew Ringgenberg, Kevin Roshak, Vincent Skiera (discussant), Laura Tuttle, participants at the SEC seminar and the New York Stock Exchange Market Microstructure conference.

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No Financial interest disclosure:

(Statement based on the American Finance Association disclosure policy, available at

https://www.aeaweb.org/journals/policies/disclosure-policy/disclosure-examples

All coauthors declare that they have no relevant or material financial interests that relate to the research described in this paper.

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1. Introduction

Early work on order-flow competition across U.S. exchanges characterizes the listing venue as the dominant market with others as satellites (e.g., Garbade and Silber (1979), McInish and Wood (1996b), Harris, McInish, Shoesmith, and Wood (1995), and Harris, Hyde, and Wood (2014)), or acknowledges imperfect competition among venues (Lipson, 2003). By contrast, recent studies of order-flow competition largely abstract away from the role of the listing exchange (e.g., Haslag and Ringgenberg (2023) and Dzieliński, Hagströmer, and Qu (2025)), plausibly reflecting substantial market-structure changes. In 2004, NYSE and Nasdaq executed roughly 80% and 50% of trading in their own listings, but by 2009 these execution shares declined to 25% and 30%, respectively (Angel, Harris, Spatt (2011)). Moreover, since early 2018, a security listed on any U.S. exchange can trade on any other U.S. exchange with minimal frictions, suggesting that the listing venue should no longer materially condition competition for order flow.

Yet when Interactive Brokers (IBKR) migrated its listing from Nasdaq to the Investors Exchange (IEX) on October 5, 2018, Nasdaq's market share in IBKR fell from 43.4% to 15.3%, while IEX's rose from 2.7% to 28.7%. This reallocation coincided with a sharp deterioration in execution quality; effective and quoted spreads more than doubled despite no changes in the availability of trading venues or market structure. A year later IBKR switched back to Nasdaq, order flow shifted back toward Nasdaq, and execution quality improved, albeit not to pre-switch levels. Economically, such order-flow migration induced by a listing change is puzzling and raises the question of whether there is a listing-venue "home-market" advantage.

In this study, we address that question. Using data from 2019–2024, we first document a sizeable listing-venue advantage in trading of their own listed securities. Across more than 8,000 securities over six years, the listing exchange captures an economically large and statistically

significant excess market share of volume. Its share is 21.7% higher when considering all trading; 15.5% higher when restricting to regular trading hours and excluding auction volume; and 13.3% higher when further excluding the first and last fifteen minutes of regular trading hours. Conditioning on order flow sent only to exchanges, listing exchanges' market shares are 27% higher. This advantage yields approximately $75 million in additional annual trading revenue for listing exchanges.[1]

We then ask what explains this listing advantage? Guided by the literature as well as practitioner insights, we examine several potential explanations. In particular, we explore whether the listing advantage is driven by the sampling year, inactive securities, small market cap securities, the time of day, the security type, the liquidity characteristics of securities, derivative expiration days that affect order flow and volume, and the particular listing exchange. None of these factors fully explain the listing advantage and the robust listing advantage persists. Below we briefly motivate each of these possible explanations, their grounding in the literature, and our tests and associated findings.

Our main finding is that the listing advantage is large and significant throughout our sample period, with perhaps a slight downward trend that appears to be driven by off-exchange trading, suggesting that the advantage of listing exchanges relative to other exchanges is persistent. We first test whether this advantage is an intraday artifact driven by proximity to the opening and closing auctions. Listing venues operate the dominant auctions (99.93% of auction volume in our sample) potentially inducing spillovers to the adjacent limit order book (e.g., orders originating from the open or auto-entered for the close). Although our baseline specifications exclude the first

[1] This is a back of the envelope estimate using our regression results, the average additional share volume received by listing exchanges in aggregate (other than in auctions) and an assumed net capture (difference between fees and rebates) of 2 mils per share, which is likely lower than the true net capture (in infra note 33).

and last 15 minutes of the trading sessions, a concern is that auction-induced flow may persist beyond these windows. Our results do not support this thesis. Although the advantage is indeed larger in the first and last 15 minutes (validating their exclusion), it remains economically large and statistically significant throughout the trading day.

Prior work suggests that optimal market design differs across liquidity tiers (Nimalendran and Petrella (2003); Madhavan and Sofianos (1998); SEC Division of Trading and Markets (2019)). This implies that thinly traded or small-cap securities may exhibit greater single-venue concentration, potentially favoring the listing exchange, whereas active or large-cap stocks should not. We first test this cross-sectional hypothesis by sorting securities into deciles of market capitalization and trading activity. We find that the listing advantage is economically large and statistically significant in every decile, although it is higher for the least active and smallest-cap stocks. Notably, however, listing venues still enjoy a 9.2% market-share advantage in the most active decile and an 11.9% advantage in the largest-cap decile.

In related tests, to examine if the listing advantage is driven by the extremes, we test the "magnificent seven" ultra-dominant (and liquid) stocks. Similarly, to isolate whether demand and trading incentives such as from funds, ETFs, and benchmarked institutional investors drive this advantage, we separately test the S&P500 versus non-S&P500 stocks. Our results indicate that the listing advantage is not driven by extremes.

Our next tests center on derivatives expiration days which generate unusually concentrated order flow (Barclay, Hendershott, and Jones, 2009) as multiple contracts expire simultaneously, prompting traders and dealers to close, roll, or hedge positions. Derivatives market makers use the closing price to mark-to-market positions and may direct volume to the listing exchange to ensure they get the closing price on the listing exchange (which can differ, even if very slightly, across

venues). Thus, on derivatives expiration dates, volume may migrate to the listing exchange, generating network externalities that lead to more trading on the listing exchange. If these mechanically high-volume sessions (e.g., double/triple witching) disproportionately route trading to the listing venue, they could create an apparent listing advantage that is really just an expiration-day microstructure effect rather than a persistent preference for the listing exchange. Therefore, we examine optionable and non-optionable securities separately as well as double- and triple-witching days and find that derivatives-expiration does not attenuate the listing exchange advantage.

Next, we test whether the listing advantage varies by security type, distinguishing common stocks from ETFs. Listing venues compete for ETF listings via market-maker incentives and fee reductions, which could render the listing exchange a relatively more attractive execution venue; such programs do not exist for stocks, suggesting ETFs might drive the aggregate effect. We also note cross-exchange heterogeneity in listing fees, issuer services, vertical integration with upstream/downstream corporate services, and market-structure design (Geranio and Lazzari, 2012). Although any listed security can trade on any exchange—implying no ex-ante listing-exchange–specific advantage—we evaluate whether the advantage applies to all exchanges. Partitioning by security type and by listing exchange, we find the listing advantage is large and statistically significant across all listing venues and present for both ETFs and common stocks, with magnitudes varying notably across exchanges for common stocks.

Finally, we examine whether the swift migration of order flow in the IBKR experience applies more broadly to listing *changes*. If our results are driven by a latent variable rather than the listing exchange, or if the listing advantage comes from economies of scale, we would expect little order flow migration from the old listing exchange to the new listing exchange. A migration

on the day of listing rather than before (e.g., in response to the announcement) or after (e.g., a drift) would imply that the underlying economic driver for the listing advantage changes on the day of the listing change, rather than being an advantage discovered by the market over time (such as better execution quality) or expected by the market upon learning of the listing change.

To explore this question, we identify all listing changes in our sample period. For the 366 listing change events during our sample period, we find that after the listing change, the old listing exchange loses just over 10% of its market share (not including auction volume) and the new listing exchange gains just over 10% market share. For this test we examine an 81-trading-days window, with 40 days before and 40 days after the listing change. We find that most of the market share migrates on the first day of the listing change with a slight drift in the first 40 days. Therefore, changes in the economic driver of this listing advantage occur concurrently with the listing change and most likely result from the listing change.

We argue that these results identify a listing advantage – that listing exchanges enjoy a market share advantage that is not driven by any easily identifiable factors. We believe that explaining this advantage requires delving more deeply into the routing incentives and practices of broker-dealers and how the particular listing exchanges factor into routing decisions. We propose four non-mutually exclusive and non-exhaustive hypotheses: the "*optimality*" hypothesis, the "*preferenced* focus" hypothesis, the "*auction* spillage" hypothesis, and the "*herding*" hypothesis. We leave the testing of these hypotheses for future research.

The "*optimality*" hypothesis says that issuers choose listing exchanges with the optimal trading structure for their shares. The "*preferenced focus*" hypothesis posits that listing exchanges may implicitly, if not explicitly, focus more on attracting order flow in their listed stocks, perhaps as a means of competing for listings. The "*auction spillage*" hypothesis states that the listing

exchange starts continuous trading with an advantage from a deep order book filled with orders that did not execute in the opening auction. Through liquidity externalities, the listing exchange retains that advantage throughout the day or at least until the listing exchange's order book starts filling with limit orders seeking to use the closing auction as a potential backstop. The "*herding*" hypothesis says that broker-dealer routing wheels preference listing exchanges because they believe listing exchanges tend to provide the deepest markets and best execution. If enough order flow is routed by this belief and others anticipate and compete for this belief-induced order flow, this routing could be self-confirming. Irrespective of the reason why this advantage exists, our results show that controlling for this sizeable listing advantage is important for empirical works, which is the main contribution of this paper. We leave the examination of which of these hypotheses explain the listing advantage for future research.

Our paper is closely related to the literature on concentration versus fragmentation. This literature focuses on whether fragmentation improves market quality, but also examines the factors associated with increased fragmentation. We contribute to this literature by uncovering the continued existence of a competitive advantage for listing exchanges. The early literature raises several exogenous factors related to listing exchange dominance,[2] such as search costs (Garbade and Silber (1979)), price competition (McInish and Wood(1996a), Blume and Goldstein (1997), Goldstein, Shkilko, Van Ness, and Van Ness (2008), price discovery and leadership (Garbade and Silber (1979), Hasbrouck (1995), and Blume and Goldstein (1997)),[3] economies of scale (Harris, Hyde, and Wood (2014)), and institutional impediments to competition (McInish and Wood (1996b), Blume and Goldstein (1997), Kam, Panchapagesan, and Weaver (2003), Brown,

[2] This early literature generally focuses on the NYSE but several studies generalize to other listing exchanges such as Amex, noting some differences (e.g., McInish and Wood (1996b)).
[3] Hasbrouck (1995) finds that the NYSE had a median information share of 92.7% in the thirty Dow Jones Industrial stocks, which were all listed on the NYSE.

Mulherin, and Weidenmier (2008), and Harris, Hyde, and Wood (2014)).[4] Some recent studies note the decline in the listing exchange's dominance but do not question whether or why any advantage exists at all (e.g., (Harris, Hyde, and Wood (2014), Haslag and Ringgenberg (2023), and Dzieliński, Hagströmer, and Qu (2025)); they focus on off-exchange rather than listed-exchange trading (e.g., O'Hara and Ye (2011)).[5]

Intuitively, technological advances and regulatory changes in recent decades have largely eliminated these exogenous factors, making the presence of the listing advantage a puzzle. Indeed, broker-dealers now employ algorithms and smart order routers to seek the most liquid trading venue, making competing on price more viable. Further, inherent institutional advantages of the listing exchanges, particularly the NYSE, have been removed with Regulation NMS, exchange rule amendments (such as the repeal of NYSE Rule 390) and other changes. Finally, if scale economies and the liquidity externality result in one dominant exchange for price discovery, why should that dominant exchange necessarily be the listing exchange?

Our paper also contributes to the literature on competition for order flow by documenting a connection between competition for listings and competition for order flow. Several studies address the determinants and impact of order routing decisions, such as trading costs, payment for order flow, make/take fees, brokers' best execution obligations, and speed (e.g., Battalio, Corwin, and Jennings (2016), Menkveld, Yueshen, and Zhu (2017), Ernst, Malenko, Spatt, and Sun (2023),

[4] Institutional impediments can include explicit trading rules such as the former Rule 390 (Kam, Panchapagesan, and Weaver (2003) or trading practices (Harris, Hyde, and Wood (2014)).

[5] Dzieliński, Hagströmer, and Qu (2025) report that the NYSE and Nasdaq each execute less than a third of the trading in their listed stocks and that European listing exchanges execute 40% of the trading in their stocks, noting that listing exchanges are not as dominant as they once were. However, this paper focuses on how the type of competition (liquidity competition, speed competition, and compliance competition) and does not question the continued advantage enjoyed by the listing exchanges. Harris, Hyde, and Wood (2014) state that, at the time, the NYSE was no longer dominant, but did not consider market share in NYSE-listed securities only but rather all listed securities.

Budish, Lee, and Shim (2024)). Our results raise questions about how the listing location factors into order routing decisions and affects execution quality.

Further, a smaller literature describes securities exchanges as facilitating two-sided markets, either in buyers and sellers, liquidity demanders and suppliers, trading and market data, or trading and listing (Cantillon and Yin (2011), Cornerstone (2022), and Hendershott, Rysman, and Schwabe (2025)). Our results are consistent with (but not dispositive of) the idea that stock exchanges can be described as a two-sided market in trading and listing, and the results can motivate further exploration into whether issuers' choice of the particular listing exchange has externalities on trading and whether trading, likewise, has externalities for issuers.

We contribute to the literature on the choice of listing venue by showing that issuers still have choice over market structure. When listing exchanges had more than 90% of the volume in their listed securities, the listing decision essentially also involved deciding on the trading structure of the issuers' shares (Macey and O'Hara (2002)). However, today, when all exchanges trade all listed securities, one could argue that listed issuers do not have a choice in the trading structure for their shares. The listing advantage documented here, however, means that the particular exchange on which shares are listed is the trading structure with the highest volume among the exchanges and, therefore, issuers do still have some choice in the trading structure for their shares.

2. Background

U.S. equity exchanges extend unlisted trading only to securities that are already listed on a U.S. exchange.[6] As a result, unlisted equity securities have an incentive to list on registered exchanges, if only to trade on them. In deciding to list shares in the U.S., an issuer has a choice of

[6] Section 2 of the Unlisted Trading Privileges Act of 1994 explicitly allows exchanges to engage in unlisted trading in certain securities that are not listed on a national securities exchange, but only if "pursuant to rule, regulation, or order of the [Securities and Exchange] Commission" approve it.

the exchange on which to list, as long as the issuer meets the listing standards and requirements. Qualified issuers can decide between listing on the NYSE, Nasdaq, NYSE American, NYSE Arca, or Cboe BZX and qualified issuers of ETFs can decide between listing on the NYSE, Nasdaq, NYSE Arca, or Cboe BZX. Listing involves meeting initial and continued standards, satisfying governance and auditing requirements and paying listing fees. In addition to trading privileges on the listing exchange and unlisted trading privileges ("UTP") on other exchanges, listed issuers also benefit from services provided by listing exchanges. Table 1 provides a summary of the listing requirements, the services provided by listing exchanges, and the fees charged.

[Table 1 here]

While financial and governance thresholds vary by exchange and market tier, most impose minimum shareholder equity, public float, and stock price requirements to ensure liquidity and investor protection. The NYSE and Nasdaq Global Market have the highest listing standards and offer the most extensive issuer support, ranging from visibility programs and investor relations tools to advisory support and trading platform access. NYSE Arca and NYSE American target smaller firms with tiered criteria and lower entry fees, while CBOE BZX offers competitive listing costs and a leaner market infrastructure. The literature on listing decisions examines several factors that issuers consider in deciding on an exchange on which to list their shares. For example, issuers may consider listing fees, the visibility provided by the listing, the signal provided by the listing, where their competitors list, voting requirements, liquidity, trading structure, and other listing services (Macey and O'Hara, 2002; Corwin and Harris, 2001; Baker, Powell and Weaver, 1999; Anderson and Dyl, 2008; Foucault and Parlour, 2004). Notably, some literature analyzes the importance of considering trading structure when selecting a listing exchange. Foucault and Parlour (2004) model the listing decisions as a reason for exchanges to differentiate their trading

structure. Cowen, Carter, Dark, and Singh (1992) find that issuers consider the trading structure of the listing exchange in determining which listing exchange would make their stock most liquid.

When these studies were conducted, listing exchanges handled the vast majority of volume in their issuers' shares. However, market structure has changed significantly since these studies on listing decisions. Indeed, when Cowen, Carter, Dark, and Singh (1992) wrote one of the first papers examining listing choice, the Nasdaq was a network of dealers posting quotes, the NYSE was an auction market facilitated by a monopolistic specialist as a market maker, and there existed frictions that significantly limited trading on other exchanges or off-exchange. The NYSE had 65% to 90% market share in its listed stocks from the late 1970s to the early 2000s. Prior to that, trading on regional exchanges and off-exchange was more limited, suggesting that the NYSE and the other major listing exchange at that time, AMEX, had even greater market share in their listed securities. Early literature provided many reasons for this listing exchange dominance (primarily focusing on the NYSE), including being the location of price discovery due to an "overwhelming proportion of order flow" (Garbade and Silber (1979)), search costs (Garbade and Silber (1979)), historical position (McInish and Wood (1996a)), and the variety of rules that provide competitive advantages (e.g., Rule 390, Kam, Panchapagesan, and Weaver (2003)). Notably, McInish and Wood (1996b) link the NYSE's dominant position to its dominance in listing.

Many of these reasons seem less important today as regulatory changes and significant technological advancements since the late 1990s have drastically increased the number of trading venues vying for volume, and improved the ability for those venues to capture order flow. Regulation NMS and other changes facilitated greater exchange competition (e.g., Harris, McInish, Sensenbrenner, and Wood (2014) and Kam, Panchapagesan, and Weaver (2003)). With

the SEC's Order Handling Rules in 1997, Regulation ATS, Regulation NMS in 2005,[7] Nasdaq becoming an exchange in 2007, and major changes to the rulebook and structure of the NYSE, other exchanges and off-exchange venues could better compete to trade stocks regardless of where they were listed. However, some exchanges, as a matter of their own policy, did not trade stocks listed on other exchanges (or particular other exchanges). This ended when, in March 2018, the SEC approved rules by the NYSE to engage in unlisted trading.[8] Since then, any U.S. stock exchange can trade any stock regardless of where it is listed in the U.S.. Budish, Lee, and Shim (2023) call this "fungibility," which is a key assumption in their model of exchange competition.

The cumulative effect of all these changes was an erosion of the dominance of the listing exchanges. In 2004, the NYSE and Nasdaq accounted for approximately 80% and 50% of the trading in their own equity, by 2009 these numbers fell to 25% and 30% respectively (Angel et al. (2011)). (Our) Figure 1 extends the Angel et al. (2011) figures to 2024.[9]

[Figure 1 here]

Panel A shows that the NYSE market share in its own listed stocks declined in the mid to late-2000s, leveled off before 2010 and has generally remained between 20% and 25% since. As of the end of 2024, no other exchange had more market share than the NYSE in NYSE-listed stocks, although the consolidated off-exchange volume exceeded that on the NYSE.[10]

Angel et al. (2011) shows that Nasdaq's market share declined after it became an exchange in 2007 as new competitors emerged. In Panel B of Figure 1 we show that Nasdaq's share of

[7] https://www.sec.gov/rules-regulations/2005/06/regulation-nms

[8] Notice of Filing of Amendment No. 1 and Order Granting Accelerated Approval of a Proposed Rule Change, as Modified by Amendment No. 1, to Adopt New Equity Trading Rules to Trade Securities Pursuant to Unlisted Trading Privileges, Including Orders and Modifiers, Order Ranking and Display, and Order Execution and Routing on Pillar, the Exchange's New Trading Technology Platform https://www.sec.gov/files/nyse/2018/34-82945.pdf.

[9] Unlike other tables/figures in this paper, in Fig. 1 we use listing exchange data from CRSP because our other source, the TAQ Master file, does not provide consistent listing exchange information for the full time series of Fig. 1.

[10] Our data do not identify particular off-exchange trading venues, but it is unlikely that any single off-exchange trading venue has more volume than the NYSE.

Nasdaq-listed stocks has since hovered between 20% and 30% from 2010 to 2024. Like the NYSE, Nasdaq's market share in its own stocks, as of the end of 2024, was greater than the market share of any other exchange but was lower than the consolidated off-exchange market share.[11]

These changes in market structure might suggest that the listing decision need not consider liquidity or trading structure. Indeed, do listed issuers' even have a choice in the market structure of their shares? An erosion of the differentiation across listing exchanges was predicted by Macey and O'Hara (2002) with the effect of competition then driving listing fees to zero. However, listing exchanges continue to charge significant listing fees, suggesting continued differentiation among listing exchanges and imperfect competition for listings. Indeed, the last two exchanges to enter the market (BATS and IEX) have been unable to attract any significant share of the listings of corporate issuers. When BATS (now CBOE BZX) first entered the listing market, its first listed issuer was its own IPO. The launch was described as a failure.[12] Since this time BATS has not been able to attract many other corporate issuers. By contrast, Nasdaq's disastrous Facebook IPO a few months later did not seem to hurt it in competing for listings.[13] IEX entered the listing market with IBKR and did not charge listing fees. When IBKR returned to Nasdaq a year later, IEX exited the listing business to "instead focus on its exchange trading operations."[14] In listing ETFs, however, the new entrant BATS has established a competitive position.

We acknowledge that one area over which each listing exchange seems to have market power is in opening, reopening, and closing auctions, which account for a large portion of volume.

[11] Our pre-2007 market shares are not as smooth as in Angel et al. (2011). The drastic shifts we document in market share of Nasdaq, regional exchanges, and off-exchange order flow relate to the following: (1) the fact that Instinet printed on regional exchanges before it was acquired by Nasdaq, (2) much of the off-exchange order flow was printed as Nasdaq trades, and (3) before Nasdaq was an exchange, some of its volume was double counted. Presumably, the smoother graph in Angel et al. (2011) reflects the data source's attempts to adjust for these effects. Indeed, the Nasdaq volume is called "matched." We thank the coauthors in Angel et al. (2011) for their clarification of this issue.
[12] After Failed IPO, When Should BATS Try Again? | Institutional Investor
[13] SEC.gov | SEC Charges NASDAQ for Failures During Facebook IPO
[14] Interactive Brokers to List its Shares on Nasdaq, Leaves IEX

From 2019 to 2024, 99.93% of auction volume (in both share and nominal terms) occurred on the listing exchange. That listing exchanges have dominant auctions appears to be a result of the evolution of the equity markets with some regulatory recognition.[15] Institutional investors have an incentive to estimate their end-of-day Net Asset Value (NAV) from closing prices that are fair prices free from manipulation.[16] Further, some of these investors also seek to trade in an auction that sets the prices used for their NAV, which are closing prices. Such investors, with an inelastic demand to trade that day and at the closing price, would be attracted to an auction with sufficient liquidity to ensure an execution at the official closing price. In effect, this could concentrate such institutions into one auction – the one with the greatest participation. Further, to avoid confusion, the consolidated tapes require there be only one official closing price and one official opening price.[17] Because there can be only one official closing price, institutions with the incentive to trade at that closing price would be unwilling to participate in an auction that could discover a price other than the one setting that price. Despite this dominance of auctions, some competitors offer alternatives that match trades at the open or close without running an auction. Current competitors include off-exchange venues and the CBOE Market Close on its BZX exchange.[18] Opening

[15] Indeed, in a comment letter on the introduction of a non-price setting closing match by CBOE BZX, the Nasdaq Stock Exchange stated "Nasdaq offers a meaningfully competitive alternative to the NYSE and NYSE [American] closing auctions." See Letter from Edward Knight to Secretary of the SEC, Brent Fields on June 12, 2017 available at SEC.gov | Comments on File No. SR-BatsBZX-2017-34 (www.sec.gov/comments/sr-batsbzx-2017-34/batsbzx201734.htm.) In addition, Regulation SCI Rule 1000 defines listing exchange opening, reopening and closing auctions as critical SCI systems and the limit up-limit down NMS Plan also specifically mentions listing exchange opening, reopening, and closing auctions in its rules.

[16] Prior to the introduction of a closing auction on Nasdaq and in response to demand from Standard and Poor's, the Amex started running their own closing auction for a selection of S&P 500 stocks listed on Nasdaq. This prompted Nasdaq to speed up the development of its closing auction. A few months after Nasdaq launched its closing auction, Amex ceased closing any Nasdaq stocks. See Smith (2005). Also, see Nasdaq Letter dated June 12, 2017 (www.sec.gov/comments/sr-batsbzx-2017-34/batsbzx201734.htm.), "The auction was established in response to the need of many market participants to execute their orders at the close and at a price that is established within a relatively deep pool of orders."

[17] www.investor.gov/introduction-investing/investing-basics/glossary/closing-price. In addition, Regulation SCI Rule 1000 defines listing exchange opening, reopening and closing auctions as critical SCI systems.

[18] See Order Setting Aside Action by Delegated Authority and Approving a Proposed Rule Change, as Modified by Amendments No. 1 and 2, to Introduce Cboe Market Close, a Closing Match Process for Non-BZX Listed Securities under New Exchange Rule 11.28 (www.sec.gov/files/rules/sro/batsbzx/soso/34-88008.pdf.

volume accounted for about 1.21% of average daily volume in 2004 while closing volume accounted for about 11.25% of average daily volume.[19]

3. Data

We use the Daily TAQ data (DTAQ) Trade File, Master File, NBBO File, and Quotes File. We construct our cross-sectional dataset using the DTAQ Trade Files from 2019 to 2024 and summarize trading volume at the exchange-ticker-date level. We start our sample in 2019 to ensure that our entire sample occurs after the 2018 rule change on NYSE that allowed exchanges to trade stocks that they do not list, and we end our sample in 2024 because that is the latest full year available at the time we undertook this study.

We focus our analysis on common stocks and ETFs because these are the securities over which a listing decision is made.[20] When a corporate issuer decides to list on an exchange, all of their equity issues list on that exchange, including preferred stock in addition to common stock. Likewise, issuers select the listing exchange for each ETF directly. From the DTAQ trade file, for each security, we collect every trade that satisfies our minimal initial screens: positive volume, positive price, and correction code 00 or 01. Our baseline sample includes all trades meeting these initial screens in DTAQ. We then aggregate the volume within the day for each exchange and for aggregated off-exchange volume in each security and divide by total volume in such security to obtain the market share of each exchange in each security (using the ticker) on that day.

We conduct this market share summarization for several subsets of trades, meant to refine our market share statistics around trading that is either predominantly on the listing exchange,

[19] These numbers are from our sample and are comparable to older estimates form Goyal, Jagadeesh and Wu (2023), who estimated that opening auction accounted for 1.5% of volume in 2022 and Jagadeesh and Wu (2022) who estimated closing volume of around 10% in 2019.

[20] We identify common stocks using codes "A" (common stock) and "H" (ADR) in the DTAQ Master File and we identify ETFs using code "ETF". We combine ADRs with common stocks because, like common stock, these represent a residual claim on a corporate issuer and the corporate issuer makes the listing decision.

related to trading that is predominantly on the listing exchange, or during extended hours, when not all exchanges compete to trade. Specifically, we identify trades executed in opening, closing, or re-opening auctions, which are predominantly on the listing exchange, using the sale condition codes 'O', '6', or '5' and estimate market shares that exclude those auction trades.[21] Additionally, we identify trades that occur outside of regular trading hours of 9:30 to 4:00 because not all exchanges offer trading before or after regular trading hours (extended hours). We use the participant timestamp in DTAQ and the sale condition codes 'T' and 'U' to identify extended hours trades and summarize market share excluding these trades. To avoid proximal impact of any opening and/or closing auctions, we also estimated market shares after excluding the first and last fifteen minutes of regular trading hours (9:45am EST to 3:45pm EST) to remove any immediate spillover impact of the opening and closing auction on the listing exchange order flow. Finally, for both of the time-based subsamples of trades, we further summarized market share both including and excluding auction trades.

This summarization results in an unbalanced panel if an exchange does not trade a given security on a given day. We convert the unbalanced dataset into a balanced panel structure, where missing values are systematically filled with zeroes for market share, except where the security did not have that particular subset of trading on any exchange/off-exchange that day. Then this daily market share data is merged with the DTAQ Master File, which allows us to distinguish the market share of the listing exchange for a given stock on a specific day from the market share of all other exchanges.

[Table 2 here]

[21] We found a very small volume in auctions executed at exchanges other than the listing exchange. We have two explanations: (1) other exchanges run auctions to compete with listing exchange auctions and (2) exchange members enter orders into auctions that operate as back-up facilities for listing exchange auctions (per Regulation SCI).

Table 2 shows summary statistics for our cross-sectional sample of listed securities. Panel A shows that the average number of all securities per year during our six sample years, before limiting the sample to common stocks and ETFs, is just over 10,000, with a clear increasing trend (from under 8,500 in 2019 to over 10,600 in 2024). The average number of ETFs (2,567) is under half of the total number of common stocks plus ADRs (5,546) included in our sample each year. While the number of common stocks remained relatively stable, the number of ETFs rose substantially—from about 1,978 in 2019 to over 3,318 in 2024—signaling the growing dominance of ETFs in U.S. markets. The number of exchanges trading a given security on a given day has grown slightly (from just under 10 to just over 11) during this period, reflecting the entry of very few new exchanges. Nasdaq and NYSE consistently listed the most common stocks (plus ADRs), with Nasdaq hosting the largest share (3,232 on average). NYSE Arca appears as the dominant exchange for ETF listings.

Panel B offers the first glimpse into our main research question. Here we present univariate results on how securities listed on specific exchanges are traded across various market centers. First, looking down along each column, we see that the "Off-Exchange" category dominates across all listing venues, accounting for between 28% and 63% of trading volume, reflecting the rise of internalization practices and dark pools in U.S. equity markets. NYSE-listed stocks, for instance, see 21.92% of their volume remain on NYSE but over 36% trade off-exchange.

What is of interest to us is that the next highest category in each column is the own-exchange trading. For example, CBOE BZX trades 18.9% of its listings, IEX 27.7%, Nasdaq 26.6%, NYSE 21.9%, NYSE American 13.6%, and NYSE Arca 21.9 %, respectively. These numbers are much bigger than each of these exchanges' trades for the listings of any other

exchange. For example, while Nasdaq trades 26.6% of its own listings, it trades only 7.8% of NYSE American listings. The same pattern obtains for every one of the listed exchanges.

We next extend these static results to a temporal dimension: What happens when a security *changes* its listing? Does the old exchange (where it was previously listed) retain its trading share advantage or does the new exchange (where it has moved) now gain the lion's share of trading? *A priori*, we do not expect any change in market share for the old or the new exchange, since any listed security can trade on any exchange using UTP.

[Table 3 here]

Table 3 provides summary statistics for a sample of 366 securities that changed their listing exchange during our sample period. We use the DTAQ Master File to identify securities that change their listing exchange and the date that they changed their listing.[22] Panel A of Table 3 shows the directional flow of listing changes between the major U.S. exchanges. Nasdaq emerges as the dominant recipient of transferred listings, gaining 70 from NYSE Arca and 61 from NYSE. NYSE also received substantial listings from Nasdaq (60) and CBOE received 33 from NYSE Arca. Most other exchanges show very little gain or loss of listings in this six-year period.

Panel B quantifies changes in dollar market share around listing change events. On average, old listing exchanges saw their market share fall from 19.67% to 6.49% after the listing change, while new exchanges experienced an increase from 5.27% to 17.93%. This suggests that listing changes are associated with a significant shift in trading activity away from the old exchange and toward the new listing exchange. For example, in 2019, on average the old exchange's market share declined from 20.89% to 8.16%, while the new exchange's rose from 5.13% to 16.83%. This pattern is fairly stable over time, with a large drop in the old exchange's market share and a large

[22] Since we use 40 days before and 40 days after the listing change for these results, we first examine and find that none of these listing changes were followed by another listing change within 40-days.

increase in the new exchange's market share in each sample year.[23] Which leaves us with an open question: Why do listing exchanges attract the largest fraction of their listed securities' trades?

4. Results

Before examining this listing advantage statistically, we believe it will be instructive to develop our intuition about market share and listing with an illustrative example. Below we present some insights from the listing change of Interactive Brokers (IBKR). This is an interesting case as IBKR first moved from the Nasdaq to the IEX exchange, and then, a year later, moved back to the Nasdaq. We show several changes associated with these moves.

4.1 IBKR Listing Changes

IBKR was a highly publicized listing change and the first ever listing on the IEX. It was announced on September 12 and IBKR switched from the Nasdaq to IEX on October 5, 2018.[24] Then, almost exactly a year later, on September 19, 2019, IBKR announced it would go back to Nasdaq and the switch happened on October 7, 2019. We drill down on this case study to explore how the continuous time trading (in addition to auctions) changed around these events. In particular, we are interested in exploring how the competitive dynamics changed across exchanges despite no actual changes in available market structures affecting continuous trading.

[Fig 2 here]

Figure 2 shows IBKR market shares for Nasdaq and IEX around the listing changes. Panel A shows the move from Nasdaq to IEX and Panel B shows the move from IEX back to Nasdaq. Each panel presents the market share (in dollar volume, and excluding opening, reopening, closing,

[23] We also examine if there is seasonality in listing changes and find some clustering in December, followed by November and January in recent years. The observed seasonal trend is consistent with the broader corporate finance literature that finds firms often time disclosures and structural changes to coincide with reporting cycles (Ritter and Welch, 2002). Overall, these seasonality numbers are a very small fraction of the total number of listed securities and are not expected to drive any results.

[24] See "IEX Lands Interactive Brokers as First Listing," Trader's Magazine, September 12, 2018. IEX Lands Interactive Brokers as First Listing.

and extended hours trades) for an 81-trading-day window, centered on the switch day. According to Panel A, the market share of IEX for the IBKR stock was entirely under 10% and then showed a slight runup just before October 5th. Then on October 5th, IEX's market share jumped to about 30% and stayed elevated around that level for the next two months. Nasdaq market share showed a sharp decline from around 40%-50% when IBKR was listed on Nasdaq to less than 20% when it moved to IEX.[25] Analogous, but opposite changes appear when IBKR switches back to the Nasdaq exchange. The straight horizontal lines, which show the average market shares pre- and post-switch show that market share of IEX drops significantly while that of Nasdaq picks up.

While the changes in the figures are unambiguous, we next present statistical tests to assess if these changes in market share are significant. Table 4 shows that the changes in market share are statistically significant and economically meaningful, whether measured by share or trade volume and whether we include or exclude the auction volume.

[Table 4 here]

Panel A shows that when IBKR switched to IEX, Nasdaq's fraction of share volume dropped from 43.35% to 15.31% while IEX's fraction increased from 2.72% to 28.65%. Then, when IBKR switched back to the Nasdaq, IEX lost 30.6% market share while Nasdaq gained almost 19% market share. The conclusions are identical (similar) if instead we use dollar volume (number of trades). The overarching implication from this example is that no matter which measure of market share we analyze, the listing exchange gains a significant fraction of the trading volume almost immediately after the switch, which mainly comes from the exchange that loses the listing. In Panel B we show the results after excluding opening, reopening, closing, and extended hours trades and find that the exact same inferences hold, although the magnitudes are expectedly smaller

[25] The pattern is similar but of higher magnitude if we include auctions and extended hours trading.

since we have excluded volume not traded on all exchanges. Together, the results in Figure 2 and Table 4 suggest that market share is affected by the listing change rather than the other way around.

When IBKR switched back to Nasdaq, they explicitly mentioned liquidity and execution quality as factors that motivated their decision. For example, IBKR's press release mentioned:

"*Last year, we switched to IEX because we believed that their advanced exchange model, including their mid-price orders and crumbling order algorithms, provided the opportunity for substantially better execution prices for orders routed there. We hoped that we would be followed by other listings and, as the exchange gained greater volume, the public investing in those shares would benefit…Unfortunately, IEX exchange could not gain more listings and there were fewer market-makers trading our stock on IEX than on Nasdaq. We gave it a year and we tried our best, but we now have to accept that, in spite of our good intentions, returning to Nasdaq will be best for our shareholders*.[26]

Therefore, we next examine liquidity changes around the listing changes.

[Table 5 here]

Table 5 Panel A shows the volume-weighted bid-ask spreads more than doubled when IBKR moved from Nasdaq to IEX.[27] Although we report the volume-weighted averages, which give more weight to quotes when share volume is heaviest and to effective spreads for larger trades, time-weighted spreads lead to similar inferences. Both Nasdaq and IEX produced reports on the changes in the quoted spreads and depth around this listing change, with IEX saying the increase is in line with changes in the VIX[28] and Nasdaq saying that the increase is because IEX is a flat fee exchange with no rebates.[29] A year later, when IBKR switched back to Nasdaq, spreads and depths fell but not back to earlier levels. This seems perplexing in light of the fact that nothing

[26] Press Release "Interactive Brokers Group to Move Stock Listing to Nasdaq": Interactive Brokers Group to Move Stock Listing to Nasdaq | Business Wire. Interactive Brokers to List its Shares on Nasdaq, Leaves IEX

[27] Note that the listing change followed the end of the Tick Size Pilot by one week. The Tick Size Pilot ended on 9/28/2018. SEC.gov | Statement on the Expiration of the Tick Size Pilot. IBKR was a control stock during the Tick Size Pilot, so we do not expect the ending of the pilot to affect our results.

[28] IEX Square Edge | IBKR on IEX: Blazing the Trail to Better Markets

[29] Nasdaq argued that the reason market quality declined is because IEX was a flat fee exchange, unlike a make-take exchange like Nasdaq. https://www.sec.gov/comments/s7-05-18/s70518-4814879-176987.pdf (page 4). Note that the listing change did not alter the fees and rebates at any exchange.

changed in how IBKR could trade other than the opening, closing, and re-opening auctions. These results show that these listing changes resulted in market-wide changes in liquidity.[30]

Panel B and C explore how the liquidity on Nasdaq and IEX might have changed in light of these market-wide changes, and we find that both IEX and Nasdaq saw large changes in the execution quality they each provided, with both providing wider quoted spreads, for example.

Panel B shows liquidity measures using Nasdaq trades and quotes only, and Panel C using only IEX trades and quotes. Prior to switching to IEX, IBKR spreads on IEX are much larger than those on Nasdaq and depth is larger on Nasdaq than on IEX. Nasdaq matched the NBBO or was alone at the NBBO much more than was IEX, and IEX often did not display two-sided quotes. However, when IBKR moves from Nasdaq to IEX, its liquidity metrics worsen on Nasdaq while they improve on IEX. Notably, Nasdaq quotes were less competitive after IBKR moved to IEX while IEX quotes were more competitive. Later when IBKR moves back to Nasdaq, Nasdaq displays more competitive quotes and offers better liquidity while the liquidity metrics worsen on IEX. These results suggest that trading on each of these exchanges fundamentally changes depending on whether they list IBKR, and this affects the overall market quality of IBKR. While we cannot conclude whether the increase in market share was caused by, or caused the market quality changes, we can say that this listing change altered execution quality in a meaningful way.

Because market makers can be integral to the liquidity offered by exchanges, our next tests into IBKR's market quality relate to market maker activity in this stock around the listing change.[31]

[Figure 3 here]

[30] The results are robust to controlling for VIX, suggesting that these liquidity changes are not explained by changes in volatility, as measured by the VIX. We also estimated the changes in Table 5 (Panels B and C) as well as the changes in Table 10 while controlling for the VIX. All of the liquidity changes remain significant and in the same direction.

[31] For this analysis, we use data released in conjunction with the Tick Size Pilot and our results only examine the listing change from Nasdaq to IEX. Currently we are also replicating these tests for the reverse switch using other regulatory (non-tick pilot) data. Those results should be available soon.

Panel A of Figure 3 shows that the number of market makers in IBKR on Nasdaq declined from 38 to 34 in the leadup to the listing change, while the number of market makers in IBKR on IEX increased from one to eight. The number of market makers on other exchanges (Panel B) seems fairly constant with small changes around the listing change, most of which were reversed. The overall number of exchange market makers rose slightly after the listing change, though the data do not allow us to distinguish the degree to which market makers are registered on multiple exchanges. Likely, this change does not represent new market makers, but rather market makers increasing the number of exchanges on which they are registered.

So, we are left with a notable case study, one which shows that market participants react to a listing exchange change by changing how they route, quote, and trade on all exchanges and venues, despite no structural changes in continuous trading. While it does not explain why the listing advantage exists, it does show that routing, quoting, and trading changes are significantly driven by the advantage of the listing exchange. So, our next question then is: Do any of the results of this case apply more broadly? In other words, is there a generalizable listing advantage? Our subsequent analysis attempt to address this question.

4.2 Listing Advantage: Main result

4.2.1 Cross-sectional tests

To examine whether the listing advantage (in terms of market share) we documented thus far applies more broadly, across all securities, we implement our empirical analysis using daily cross-sectional panel regressions from 2019 to 2024, estimated as follows:

$$Y_{i,j} = \alpha + \beta_1 \cdot list_exch_d_{i,j} + \beta_2 \cdot Security\ FE + \beta_3 \cdot Exchange\ FE + \varepsilon_{i,j} \qquad (1)$$

where $Y_{i,j}$ represents the market share of exchange *i* for security *j* measured over the subsets of trading discussed before: all trading, all trading excluding auctions, all regular hour trading

(including auctions), all regular hours trading excluding auctions, and trading between 9:45-3:45 (including auctions), and trading between 9:45-3:45 excluding auctions. The main independent variable of interest is $list_exch_d_{i,j}$, which is an indicator variable that equals one if the exchange is the listing exchange for the ticker on the day, zero otherwise. We include firm fixed effects to account for time-invariant firm characteristics and exchange fixed effects to control for systemic differences across trading venues. For each regression using different versions of $Y_{i,j}$, we estimate three models to assess the robustness of our results. Specifically, we estimate regressions using (1) heteroskedasticity-robust standard errors, (2) standard errors clustered at the ticker level, and (3) standard errors clustered at both the ticker and exchange levels. This approach ensures that our findings are not driven by the choice of standard error adjustment and account for potential within-group correlations. Our results are consistent across all three specifications and we report the results of the third specification – standard errors clustered at both the ticker and exchange levels in Table 6 and in subsequent tables.

[Table 6 here]

Table 6 shows the results of equation (1) regressions. In Panel A, we provide a summary of the coefficients of the daily regressions. The last column "Mean Obs." shows the number of security-day observations included in each set of tests. "Mean" is the average of the coefficients on $list_exch_d_{i,j}$ across all days (there are 1,510 days for which we summarize the coefficient on is $list_exch_d_{i,j}$). For example, the first row shows that when we include the full day including auctions the average of those coefficients is 21.69, with 100% of the days being significant, indicating that the listing advantage is on average 21.69% in terms of dollar market share and is significant every day.

The successive rows in this panel examine whether certain times of the day or auctions versus non-auction trades explain the listing advantage. Depending on which subset of the $Y_{i,j}$ variable we are examining, the advantage drops, which is expected since we are excluding trade types that are predominantly on the listing exchanges. However, what is noteworthy is that (a) the listing advantage is significant every single day for all six years, and (b) even when we exclude auctions, extended hours trading, and the first and last fifteen minutes of continuous trading in regular trading hours (last row of panel A), the advantage remains sizeable (13.34% of the dollar market share).[32] Inferences are similar if we use the median instead.

Using the average coefficients in Table 6, we estimate this advantage in terms of trading revenue. We start with the total share volume each year of our sample across all exchanges and multiply by 0.89 to remove auction volume. We then multiply by 0.1516, which is the listing advantage that includes all trading (e.g., the extended hours trading) but not auction volume. This gives the average additional share volume received by listing exchanges in aggregate (other than in auctions). We multiple the result by 2 mils to obtain the trading revenue, which assumes that the average trading fee net of trading rebates (or net capture) for listing exchange is 2 mils.[33] This results in annual estimates ranging from just under $50 million to a little over $80 million, with an average of around $75 million across all listing exchanges. To put this in context, the average listing revenue reported by the Intercontinental Exchange (parent of three U.S. listing exchanges) reported average aggregate revenues of around $470 million per year from 2019 to 2022.

[32] Note that the sample that includes trading from 9:45-3:45, including auctions, shows a slightly higher advantage. The difference in this row and the row excluding auctions is that this row includes trades that reopen trading following trading halts and trading pauses. Trading following halts and pauses does not resume until the listing exchange trades. (LULD NMS Plan V(B), V(C), VII(B), and VII(C) and CTA Plan Article VII, Section 7.1.) These rows are very similar because trading halts and pauses are fairly rare events.

[33] The Proposal on Volume-based Exchange Transaction Pricing for NMS Stocks reports net captures of 4.5 mils for the NYSE exchanges, 6.4 mils for the Nasdaq exchanges, and 1.9 mils for the Cboe exchanges. (See notes 108, 109, and 110 on page 76302.) Our assumption of 2 mils could, therefore, be on the low side. If the average for listing exchanges is more like 4 mils, our estimate would be twice as large.

4.2.2 Off-exchange trading

Earlier (Table 2 Panel B), we showed that off-exchange trading has been increasing significantly throughout our sample period. And nowadays, off-exchange trading volume is larger than on-exchange trading volume. Thus, we also examine the magnitude of the listing advantage, conditional on an exchange execution. Panel B of Table 6 present the results. As expected, the results show that the listing advantage is much larger if we condition the market share on trading on an exchange. When focusing on trading from 9:45 to 3:45, excluding auctions, and conditioning on an exchange execution, the listing advantage is 26.95% of this conditional market share. Comparing the mean values of the $list_exch_d_{i,j}$ coefficient for the same partitions of $Y_{i,j}$ between panels A and B, we find that every analogous value is higher in Panel B than Panel A. Additionally, as in Panel A, in Panel B also 100% of the daily regressions show significant listing advantage.

4.2.3 Temporal trend

We next examine whether the listing advantage is stable over time or is declining, potentially because of competitive pressure. These results are shown in Figure 4.

[Figure 4 here]

Figure 4 figure plots the monthly average coefficient (i.e., the listing advantage) from regressions of equation (1) and compares the results when estimating equation (1) for market shares that include off-exchange trading (blue line) and market shares conditional on exchange trading (red line). Consistent with the results in Panel B of Table 6, the listing premium is strictly greater when off-exchange trading is excluded. However, both lines show the presence of a sizeable listing advantage throughout our sample period, the magnitude oscillates around 15% (25%-30%) with (without) off-exchange trades. Of note, the listing advantage that includes off-exchange trading shows a slight downward trend while the listing advantage that does not shows

no trend, suggesting that the slight downward trend is driven by off-exchange trading. Relative to other exchanges, the listing advantage does not appear to be getting smaller over these recent six years, suggesting that other exchanges are not successfully competing away this listing advantage.

4.3 Listing Advantage: Exploratory tests

To ensure the robustness of our findings and to guard against the possibility that the observed listing exchange advantage is driven by specific subsets of the data, we conduct a series of exploratory tests. These tests are designed to examine whether the listing advantage persists across various dimensions of the data, including time, trading activity, market capitalization, security type, exchange venue, and time-of-day. By systematically evaluating the consistency of the listing advantage across these partitions, we aim to evaluate if the effect is pervasive, or if it is confined to a particular segment of the market. This comprehensive approach is essential before concluding that the listing exchanges have a definitive advantage.

4.3.1 Intraday variation

In the previous sections, we presented results with various subsets of the dependent variable $Y_{i,j}$, explicitly recognizing that opening, closing, and reopening auctions may affect the listing premium. However, we also recognize that some overflow from the opening auction may increase the trading on the listing exchange near the open and the option to have an unfilled order enter the closing auction may attract more trading to the listing exchange near the beginning and end of regular trading hours. These arguments suggest that a temporal intraday pattern may also be associated with the listing advantage. To examine whether the listing advantage is confined to spillover effects at the beginning and/or end of the day, we estimated our regressions for each

fifteen-minute period during regular trading hours.[34] We then aggregate the coefficients, which indicate the listing advantage for each fifteen-minute period. Figure 5 plots the results.

[Figure 5 here]

We find that the listing advantage is highest (over 20%) in the last fifteen minutes of regular trading hours and is higher (over 17%) in the first fifteen minutes of regular trading hours. However, a sizeable premium (of over 10%) is present throughout the day. Based on these results, we exclude the first and last fifteen minutes of trading from all of our subsequent regressions. This provides further assurance that these two fifteen-minute periods do not drive our results.

4.3.2 Liquidity and Optionality

Prior research indicates that trading activity away from the listing exchange varies systematically with a security's liquidity. Nimalendran and Petrella (2003), Madhavan and Sofianos (1998), and the SEC Division of Trading and Markets (2019) all emphasize that the structure and efficiency of trading venues matter more for thinly traded and small-cap securities. For instance, Nimalendran and Petrella (2003) show that hybrid market structures involving specialists are particularly beneficial for illiquid stocks, while Madhavan and Sofianos (1998) demonstrate that dealer intermediation is more valuable for less actively traded securities. Similarly, Hasbrouck (1995) (among others) reports that trading of NYSE-listed securities on off-NYSE trading venues concentrates in large capitalization stock. Further, Haslag and Ringgenberg (2023) find that the negative effects of fragmentation are greater for smaller stocks. Moreover, the most recent amendment to Rule 606, which requires routing disclosure, changed the requirements

[34] These intraday regressions differ from the other analyses in that they estimate the market share of dollar volume (excluding auctions) at the 15-minute interval level and is estimated for each year from 2019 to 2024 instead of daily. Specifically, for each 15-minute interval from 9:30 to 4:00, we regress the exchange's market share on *list_exch_d*. These regressions include ticker and exchange fixed effects and are clustered by ticker and exchange. The results are averaged across years for each 15-minute interval. We do this to isolate any possible intra-day seasonality, other than those that we explicitly recognized by partitioning the dependent variable $Y_{i,j}$ in equation (1).

from separating statistics by routing exchange to separating statistics by S&P 500 inclusion, largely because commenters and an advisory committee indicated that order handling varies more by "market capitalization and trading volume" than by listing exchange.[35] Drawing from this information, one plausible driver of the listing exchange advantage may be the stock's liquidity or the size of the firm. Specifically, trading in less active or smaller-cap stocks may be more likely to concentrate on the listing exchange, whereas actively traded or large-cap stocks may experience more dispersed order flow. If this explanation holds, the listing advantage should attenuate for the most liquid and largest securities.

To ensure that we are capturing a listing advantage rather than the natural concentration of liquidity in the smallest or least active stocks, we estimated our regressions by partitioning our sample stocks by deciles of market capitalization and trading activity. Results are in Table 7.

[Table 7 here]

Panel A provides the results for the market capitalization deciles. While the lowest market cap decile has the highest average listing advantage, all the market cap deciles show a sizeable advantage, varying from 11.91% (highest decile) to 16.05% (lowest market cap decile) of market share. The median listing advantage parallels the same patterns. In 100% of the trading days these coefficients are significant regardless of market cap. Panel B presents analogous results but now partitioning by trading activity. The decile with the fewest trades per day has the highest (21.02) premium while the one with the most trades has the lowest (9.18) premium. We also examine the ultra-liquid "magnificent seven" stocks that may have heightened attention and thereby attract

[35] See Disclosure of Order Handling Information (2018-24423.pdf), Nov. 19, 2018 (p. 58378), letters by IHS Markit (p. 32), Fidelity (p. 9), and Schwab (p. 3) (available at SEC.gov | Comments on Proposed Rule: Disclosure of Order Handling Information) and recommendations by the Equity Market Structure Advisory Committee (Equity Market Structure Advisory Committee Recommendations Regarding Modifying Rule 605 and Rule 606).

disproportionately large order flow/volume. In Panel C, we find that the listing advantage for these stocks is about 20%.

Derivative expirations are another possible factor that may associate with listing advantage. Derivative expiration days induce extreme, predictable, and largely non-informational liquidity shocks in the underlying cash market as index arbitrage and hedging concentrate order flow around futures expirations (Barclay, Hendershott, and Jones, 2009). In such days, order consolidation mechanisms (i.e., centralized call/auction processes) can become particularly important for price formation. Therefore, if the listing venue's microstructure (e.g., auction design, consolidated liquidity at key times) attracts a larger share of trading specifically during these high-liquidity-demand episodes, the measured listing advantage could (partly) reflect expiration-day order-consolidation effects rather than a persistent venue preference. Accordingly, we separate optionable securities from non-optionable securities and examine whether the listing advantage disappears for the former group. Results in Panel C show that both optionable and non-optionable securities enjoy a sizeable (13.53% and 27.16%, respectively) listing advantage, thereby ruling out this explanation.[36]

We also split the sample into S&P500 versus non-S&P500 stocks because S&P500 inclusion mechanically increases ownership and trading by benchmarked institutions and index-tracking funds, which can systematically alter order-flow composition, liquidity provision, and routing incentives relative to otherwise similar non-index stocks. Results in Panel C show that the listing advantage is significant in both S&P500 and non-S&P500 stocks. Overall, the results here suggest that while low liquidity stocks have a higher listing advantage, these are not the only stocks

[36] In further (untabulated) tests, we examined if there are differences between double- and triple-witching days and find no supporting evidence; the listing advantage is comparable across both groups.

where we see this advntage. In fact, listing exchanges have a sizeable advantage even in the securities with the highest trading activity, largest market cap, and in optionable securities.

4.3.3 Security type

We further want to ensure that our listing advantage is not unique to one exchange or to stocks vs ETFs. Indeed, some exchanges have had programs that provide incentives to make markets in their listed ETFs. To address this point, we estimate our regressions after partitioning on both type of security (stock/common ADR vs ETF) and listing exchange. In all, there are eight separate partitions that we estimate: Common Stocks listed on Nasdaq, Common Stocks listed on NYSE, Common Stocks listed on NYSE/Amex, Common Stocks listed on NYSE/Arca, ETFs listed on CBOE/BZX, ETFs listed on Nasdaq, and ETFs listed on NYSE/Arca, and ETFs listed on NYSE. Table 8 presents the results.

[Table 8 here]

Overall, we find that irrespective of the security type or which specific exchange they trade on, the listing advantage is sizeable and persistent. Of the three exchanges with the most listings, NYSE Arca enjoys the highest competitive advantage in the trading of its corporate issuers (38.30% of market share) but only has a few listings; NYSE/Amex enjoys the lowest (9.80%), with NYSE and Nasdaq in between (19.50% and 25.59%, respectively). Notably, the advantage is statistically significant in all 1,510 daily regressions for stocks listed on Nasdaq and NYSE, but the listing advantage is still significant for 82% of daily regressions for the NYSE/Amex and 58% of daily regressions for NYSE/Arca. Exchanges listing ETFs enjoy a high listing advantage in the range of 12.4% to 17.7%. The ETF listing advantage is significant on 100% of days on three exchanges and on 73% of days on the newest ETF listing exchange, the NYSE. Similar inferences hold when using the median instead of the average listing advantage.

4.3.4 Listing Changes

The results of the previous sections show that, on average, the listing exchanges have significantly greater market share in their listed securities than other exchanges do, and this result is not driven directly by the opening and closing auctions, is not limited to one exchange or a subset of exchanges, is persistent throughout the six years we have sampled, is persistent throughout the trading day, and is not solely in small or inactive stocks. At this point, we can't rule out that the listing advantage isn't driven by economies of scale where the listing exchanges have a greater market share because they are larger and more liquid than other exchanges. We also can't rule out that the listing advantage is driven by a factor correlated with where the stock is listed rather than the listing exchange itself.

To address these questions, we dive deeper into a sample of all listing changes in our sample period. In particular, if the listing exchange advantage is driven by economies of scale or a latent factor, we would not expect to see an immediate migration of order flow from the old listing exchange to the new listing exchange. Indeed, the economies of scale of a listing exchange is unlikely to change much with one marginal listing. Further, any unknown latent factor affecting the trading venue of choice that is correlated with but not resulting from the listing exchange is unlikely to change much on the day of the listing change (but could be revealed at the announcement of a listing change).

[Figure 6 here]

Figure 6 plots the market share of both the old listing exchange and the new listing exchange for our full sample of 366 listing changes. We show the market share in dollar volume and exclude opening, reopening, closing, and extended hours trades. The vertical line indicates the first day of the listing change, the blue line shows the share for the old exchange, the red line

for the new exchange, and the horizontal lines show the averages pre- and post-switch. It is clear that almost on the day of the listing change, the old exchange loses about 10% (a drop from over 20% to under 10%) of the market share in these stocks. In the meanwhile, the exchange that gains the listing gains well over 10% of the market share (a gain from around 7% to around 20%). Over the next two months (40 trading days), these share losses and gains persist, very similar to what we documented for the case study on IBKR's listing changes.

To provide statistical significance for these results, we also present regression results for our sample of 366 listing changes. Specifically, we modify our regression model to measure both the acquiring exchange's market share advantage and the losing exchange's loss of market share. To measure these, we estimate the model specified in equation (2) below:

$$Y_{i,j,t} = \alpha + \beta_1 \cdot Old_{i,j} + \beta_2 \cdot New_{i,j} + \beta_3 \cdot Post_t * Old_{i,j} + \beta_4 \cdot Post_t * New_{i,j} + \varepsilon_{i,j,t} \qquad (2)$$

Here $Y_{i,j,t}$ is the dependent variable (market share) estimated for each exchange *i* for security *j* for trading day *t*, while the independent variables $New_{i,j}$ and $Old_{i,j}$ are indicators for the new listing exchange and the old listing exchange, respectively. $Post_t$ is a dummy variable that takes the value of one after a listing switch, zero before. We consider only the 40 days before and after the listing change, centered on the listing change. The coefficients of interest are β_3 and β_4, which indicate the market share change for the old exchange (which loses the listing) and the new exchange (which gains the listing), respectively. We estimate this equation using market shares for the new and old listing exchanges only – the market shares of other exchanges are excluded. As in equation (1), we include fixed effects for security and exchange and estimate this model with standard errors clustered at both the ticker and exchange levels.

[Table 9 here]

Table 9 shows the results of this regression for our sample of listing changes in each of our sample years. This shows results for the sample that excludes auctions, extended hours, and the first and last fifteen minutes of regular trading. Table 9 reports the results for standard errors clustered at both the ticker and exchange levels. The coefficient on $Post * Old_{i,j}$ (indicated as Old Listing Exchange*Post-switch) is -9.23%, which is significant at the 99% confidence level. Similar magnitude of change (8.64%) but with the opposite sign obtains for the $Post * New_{i,j}$ (indicated as New Listing Exchange*Post-switch), also significant at the 99%. Thus, the listing exchange loses significant market share when it loses a listing, and almost the same amount of market share is gained by the exchange acquiring the listing. This pattern is stable and persistent across the entire sample period. For each year we find the same effect; the exchange that loses the listing loses market share, the exchange that gains the listing gains market share, although the magnitude of market share gains and losses are not always the same each year.

The migration on the day of listing rather than before (e.g., in response to the announcement) or after (e.g., a drift) implies that the underlying economic driver for the listing advantage changes on the day of the listing change rather than being an advantage discovered by the market over time (such as better-quality executions) or expected by the market upon learning of the listing change. These results also suggest that the listing advantage is not purely driven by economies of scale. Clearly, the economic driver of this listing advantage changes on the day of the listing change and is likely a result of the listing change.

One potential factor that could change with a listing change is the fee charged or rebate paid by each trading exchange. We understand that some exchanges charge different fees depending on whether the security is reportable to Tape A, B, or C. Tape A securities are those listed on the NYSE; Tape C securities are those listed on Nasdaq; and Tape B securities are listed

on all other exchanges. Therefore, the trading of any security switching to or from the Nasdaq or NYSE would experience different fees, which could alter where the securities trade. Notably, the trading in securities that switch exchanges but stay on Tape B should be subject to the same fees both before and after the switch. Therefore, we can examine the influence of fees by focusing on just those securities that changed listing exchanges but continued remain on Tape B. The results are in the far-right column of Table 9 and show that the old listing exchange loses 7.89% of its market share and the new listing exchange gains 6.61% in market share upon a listing change. This result does not support the notion that this particular fee structure drives the listing advantage.

[Table 10 here]

We next examine the economic significance of this migration by examining whether these 366 listing changes are associated with changes in overall execution quality and the execution quality and quote aggressiveness on the old and new listing exchanges. Table 10 Panel A shows that listing changes are associated with greater quoted spreads, but only nominal spreads as opposed to quoted spreads measured in basis points. Effective spreads decline with listing changes by about 3.43 bps. This is consistent with Barclay et al. (1999) and Weston (2000).

Like in the IBKR case study, our analysis of the execution quality and quote aggressiveness of old and new listing exchanges shows that the old exchanges post less competitive quotes while the new exchanges posts more competitive quotes.[37] The old exchanges have wider BBO quotes, and they match or set the NBB or NBO less often in the listings that move away. Conversely, the new exchanges tend to post narrower BBO quotes and match and set the NBB or NBO more often in their new listings. These results do not necessarily translate into the effective spread changes one might expect. The old listing exchanges actually offers improved effective spreads while the

[37] The quoted depth in Table 10 appears large. The magnitude of the average depth is driven by four outlier securities on distinct dates: PANA on 4/7/2021, EVE on 6/12/2023, HEXO on 8/24/2021, and JPST on 9/15/2022.

new listing exchange offers the same effective spreads it did before the listing change. These deviations and the comparison of the changes in the old and new listing exchanges to the market-wide changes suggests that quoting and effective spreads changes at other exchanges as well.

5. Potential Explanations for the Listing Advantage

We propose several mechanisms that future work could evaluate to rationalize the listing advantage, with a unifying emphasis on broker routing and why routing may systematically favor the listing venue. Specifically, we consider: (i) issuer optimal venue choice, (ii) listing-venue incentives to cultivate liquidity in their listed names, (iii) spillovers from dominant opening/closing auctions into continuous trading, and (iv) routing-algorithm preferencing of the listing exchange.

First, order flow may endogenously concentrate on the listing exchange because that venue provides the issuer the best bundle of trading and ancillary services, yielding superior liquidity – an *optimality* view in the spirit of Cowen, Carter, Derk, and Singh (1992). This straw-man null implies that a binding listing switch should induce immediate migration at the announcement; instead, we observe migration primarily at the effective date (both in the IBKR listing change and in the broader sample), alongside deteriorated execution quality in the IBKR case study.

Second, in a *preferenced focus* hypothesis, listing exchanges may devote resources and/or deploy fee and market-structure levers to intensify liquidity provision in their listed securities, potentially as part of competition for listings. Consistent with this possibility, Figure 3 shows registered market makers for IBKR on IEX rising ahead of IBKR's Nasdaq to IEX switch, and NYSE fee schedules (as of April 1, 2025) explicitly differentiate pricing for Tape A (NYSE-listed) versus Tape B/C securities, with auction tiers potentially linked to regular-hours volume, suggesting testable cross-venue incentive gradients embedded in complex rulebooks and pricing schedules.

Third, the listing advantage may arise indirectly from the dominance of the opening and closing auctions (*auction spillage*): unexecuted auction interest seeds the listing venue's limit order book early, creating depth/quote-competitiveness that attracts incremental liquidity demand via a liquidity externality; later, traders seeking the closing auction as a backstop may submit orders to the listing venue, reinforcing depth throughout the day.

Finally, brokers may systematically preference the listing exchange in smart-order-routing, even when it is not at the NBBO, because routing logic is often conditioned on historical execution performance and coarse state variables (Ernst et al., 2024), making persistent listing-venue preferencing a low-cost heuristic. In this *herding* mechanism, anticipated inbound marketable flow attracts additional displayed liquidity to the listing venue, rendering its liquidity advantage self-confirming.

The final two mechanisms can be separated empirically by comparing routing-to-best-quote versus routing-to-listing-venue conditional on quotes: Bessembinder (2003) shows off-NBBO venues still receive flow, while Boehmer, Jennings, and Wei (2007) find that low realized execution costs and fast fills predict subsequent order allocation. Under herding, the listing venue should attract market orders even when not quoting best (though it may still be deeper on average); under auction spillage, auction preeminence drives depth, and depth then attracts flow, the opposite causal direction. However, multiple drivers may explain the listing advantage. Regular-hours routing motivated by volume incentives for discounts on auction fees (preferenced focus) can also look like "herding" when the listing venue is not best-quoted, and auction spillage does not explain why listing venues have preeminent auctions in the first place. In sum, while no single hypothesis is likely to fully account for the listing-exchange advantage, some combination might. We leave this for future work.

6. Conclusion

We document a robust and economically significant market share advantage enjoyed by exchanges in the trading of their listed securities. Across a comprehensive sample of over 8,000 securities from 2019 to 2024, we find that listing exchanges, on average, secure a 13% to 22% higher share of trading volume relative to non-listing exchanges. This advantage persists across a range of controls and trading conditions, including exclusions of auction activity, off-exchange volume, derivative expiration days, and key intraday intervals, and remains significant for every day in the sample period. The advantage is not limited to any particular subset of securities—whether by size, liquidity, security type, or listing venue—making it a puzzling feature of modern market structure.

The magnitude and consistency of this effect endure when removing auctions and the fifteen minutes nearest the auctions. Further, when securities change their listing venue, market share shifts almost immediately to the new listing exchange, by approximately 10%, on the very first day of the change, affirming that the listing exchange itself is a meaningful economic determinant of order flow. These findings challenge prevailing assumptions about fungibility in U.S. equity markets and contribute new insights to the literature on market fragmentation, exchange competition, and the economics of listing. We propose four hypotheses, optimality, preferenced focus, auction spillage, and herding, that may underlie this advantage. Future research should explore the drivers of routing decisions and the potential externalities of listing venue choices. As such, this study establishes the existence of a listing advantage and lays the groundwork for a new research agenda at the intersection of exchange design, routing policy, and market quality.

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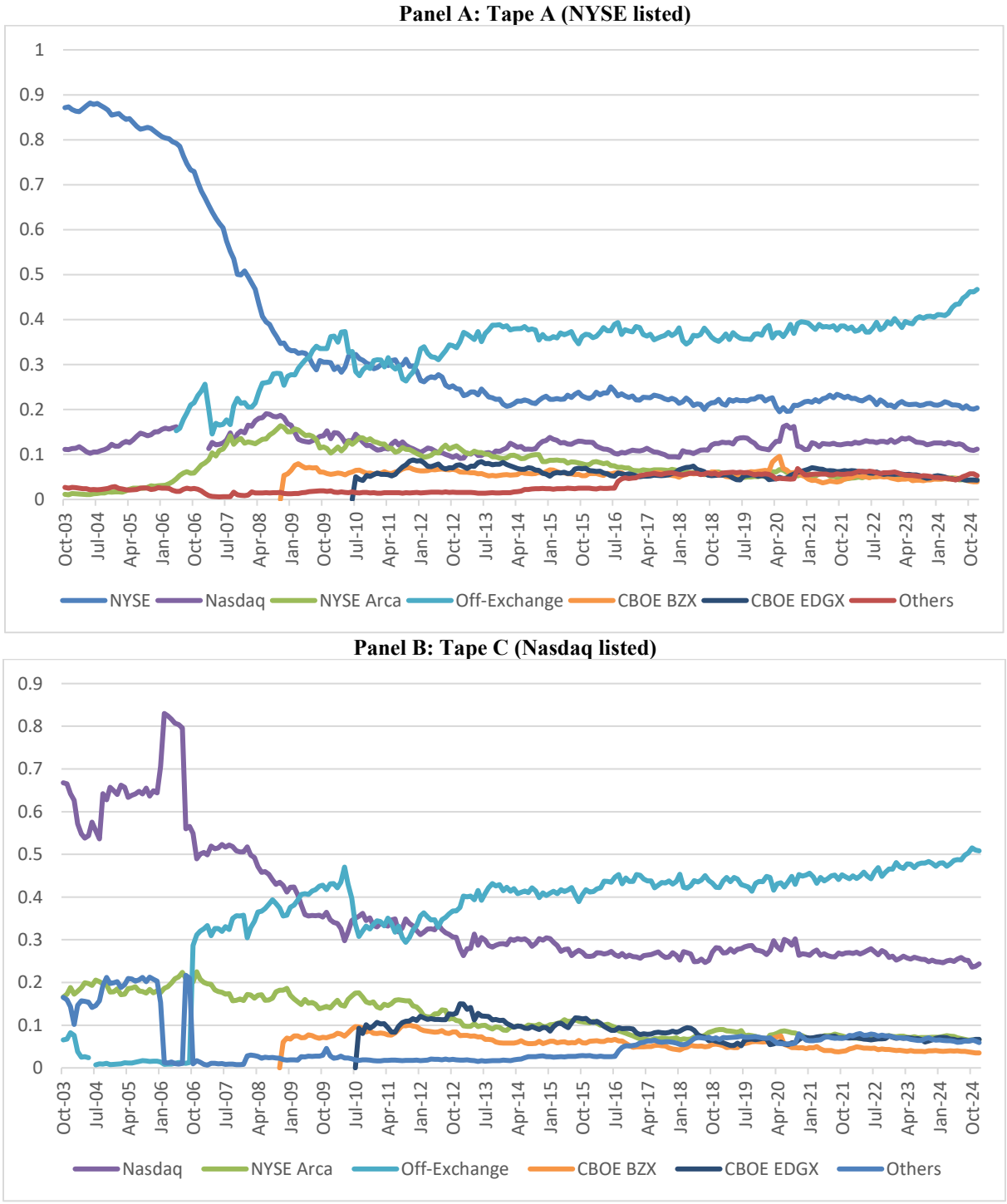
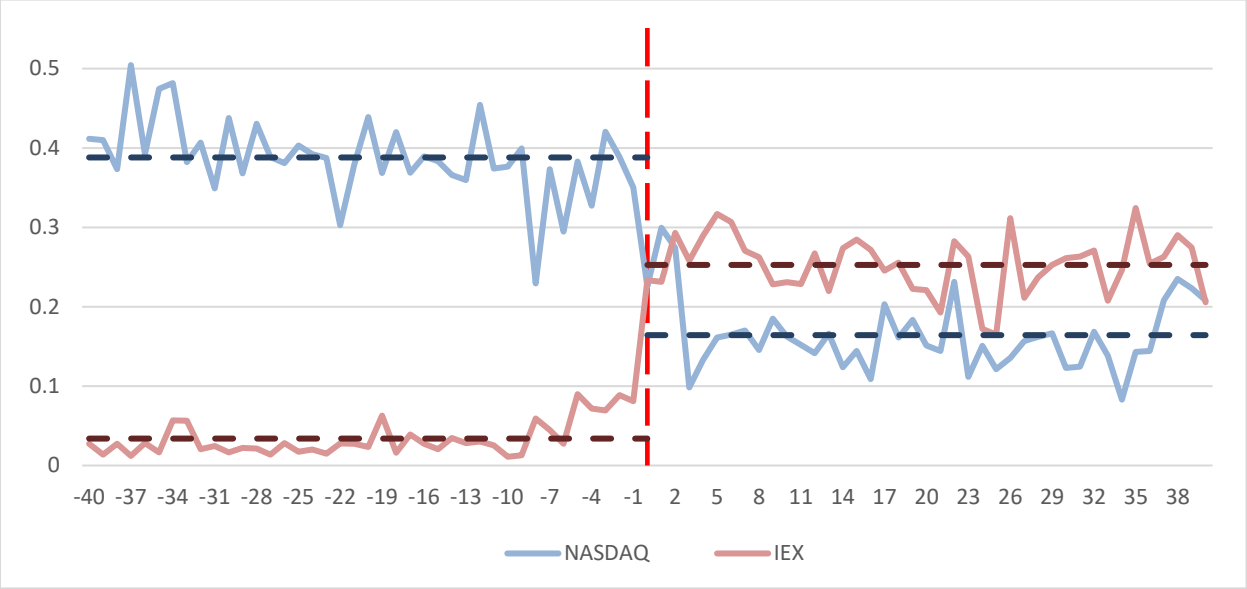


Figure 1: Exchange Market Share over Time.

This figure replicates and expands on figures Angel et. al (2011) using notional volume data from the TAQ Trade files and listing exchanges from CRSP. Panel A shows the market share for Tape A securities, which are listed on NYSE. Panel B shows the market share for Tape C securities, which are listed on Nasdaq. This figure does not include Tape B securities because those are listed on several exchanges. This is consistent with the approach in Angel et. al (2011).

Panel A



Panel B

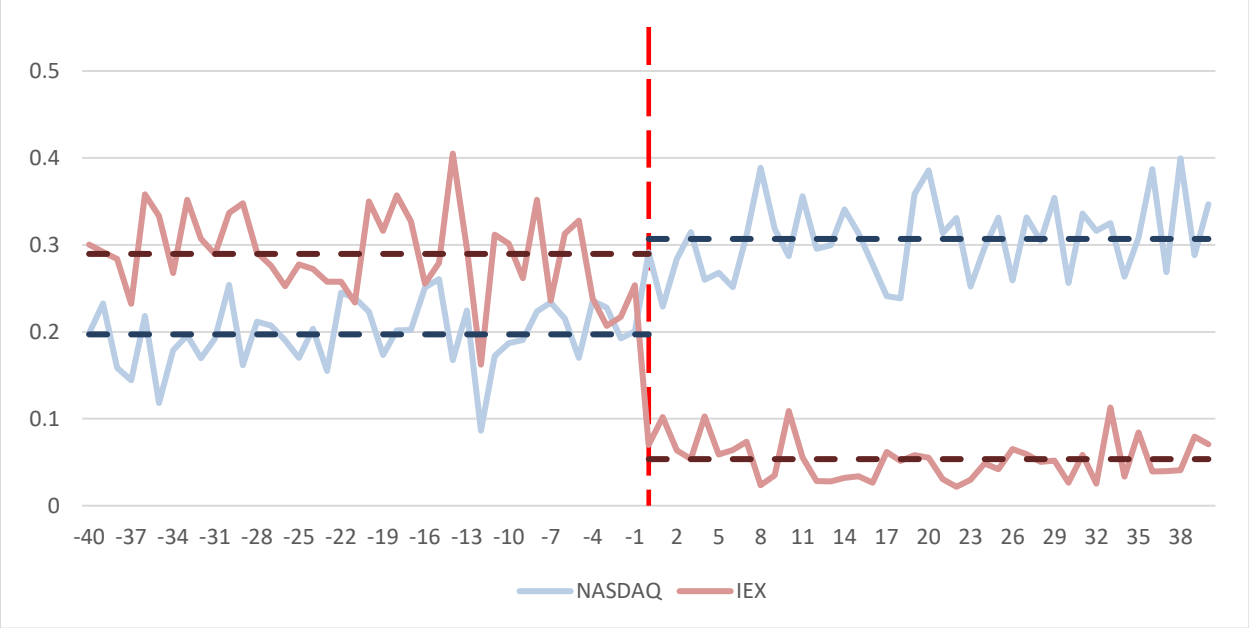
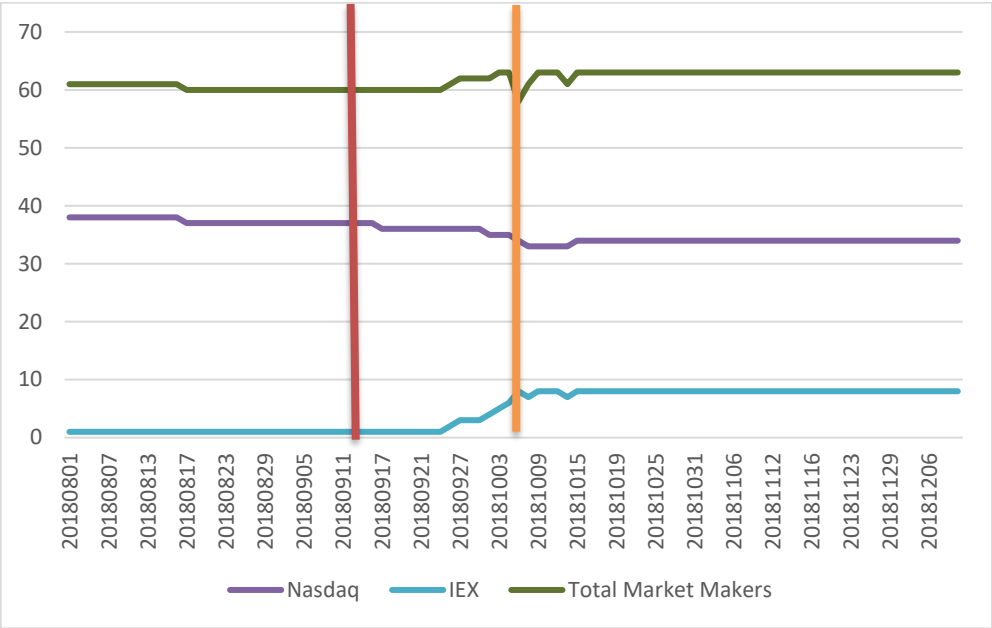


Figure 2: Market Share in IBKR

This figure shows the market share of NASDAQ and IEX in IBKR when IBKR switched from Nasdaq to IEX (an 81 trading day window before and after October 5, 2018, Panel A) and when IBKR switched from IEX to Nasdaq (an 81 trading day window before and after October 7, 2019, Panel B). The market share is in dollar volume and excludes opening, reopening, closing, and extended hours trades. The vertical line indicates the first day of the listing change.

Panel A:



Panel B:

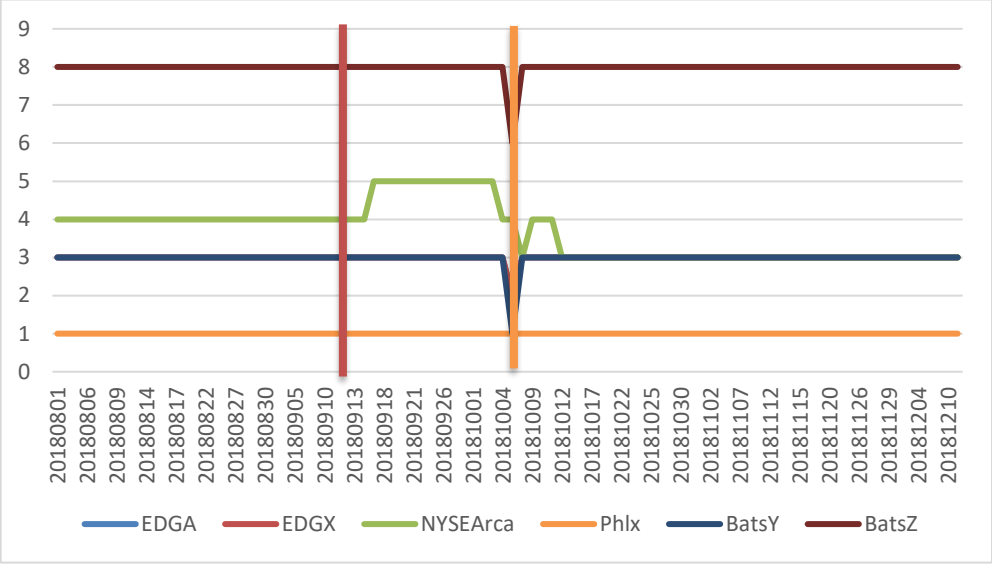


Figure 3: Number of Market Makers in IBKR

This figure shows the number of market makers registered in IBKR on exchanges from August 1, 2018 to December 11, 2018. Panel A shows the number of registered market makers on Nasdaq, IEX, and in total using Tick Size Pilot Data. Panel B shows market maker participation on Nasdaq, IEX, and in total using Tick Size Pilot Data. Data are from the Tick Size Pilot data B.III and B.IV made public by the exchanges and FINRA. The vertical lines indicate the announcement date of the listing change from Nasdaq to IEX and the date the listing change became effective.

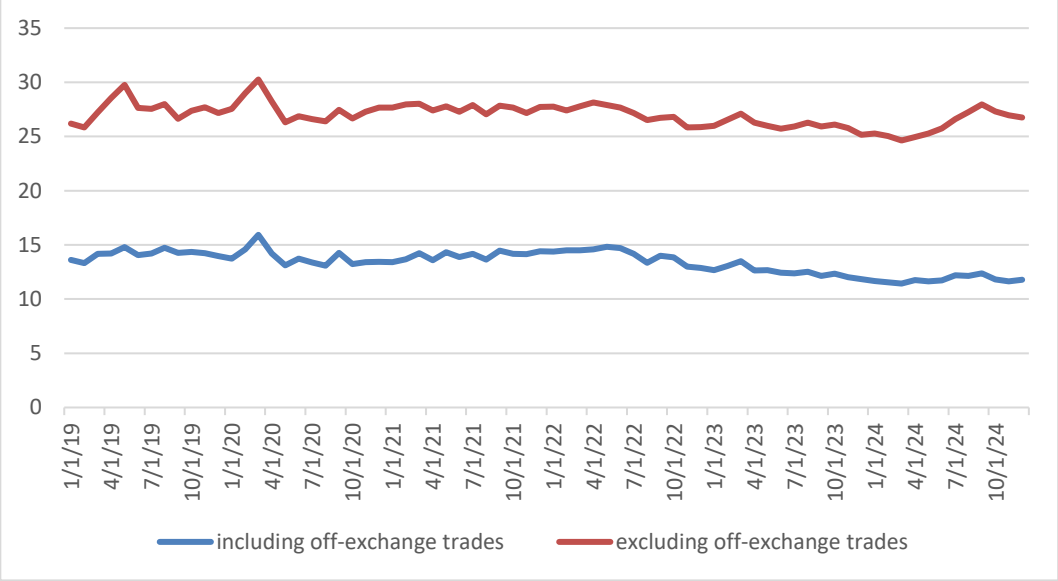


Figure 4: Listing Advantage Trends over Time

This figure plots the monthly average coefficient from regressions of equation (1) identifying the listing advantage each month in the sample period 2019-2024. The figure compares the results when running equation (1) for overlapping subsets of data by participant timestamp and including/excluding off-exchange trading. Blue line shows the coefficients when including off-exchange trades from 9:45 to 15:45, while red line shows the coefficients when excluding on-exchange trades.

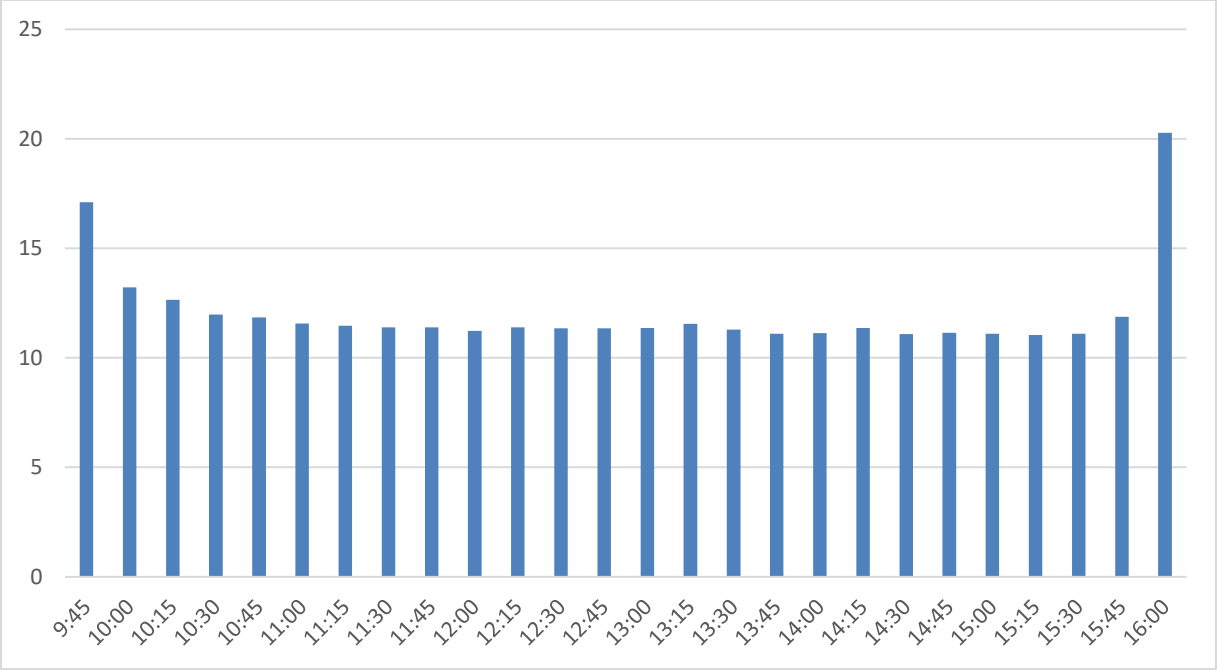


Figure 5: Listing Exchange Advantage Throughout the Day.

This figure plots the coefficients from regressions in equation (1) identifying the listing advantage throughout the trading day. Each trading day is broken into fourteen half-hour long segments and equation (1) is estimated on each segment/day. Market share is the dollar value market share estimated on trades that exclude opening, closing, and re-opening auctions and extended day trading. The coefficients indicate the percent of trading volume that executes on the listing exchange above what is predicted by the model.

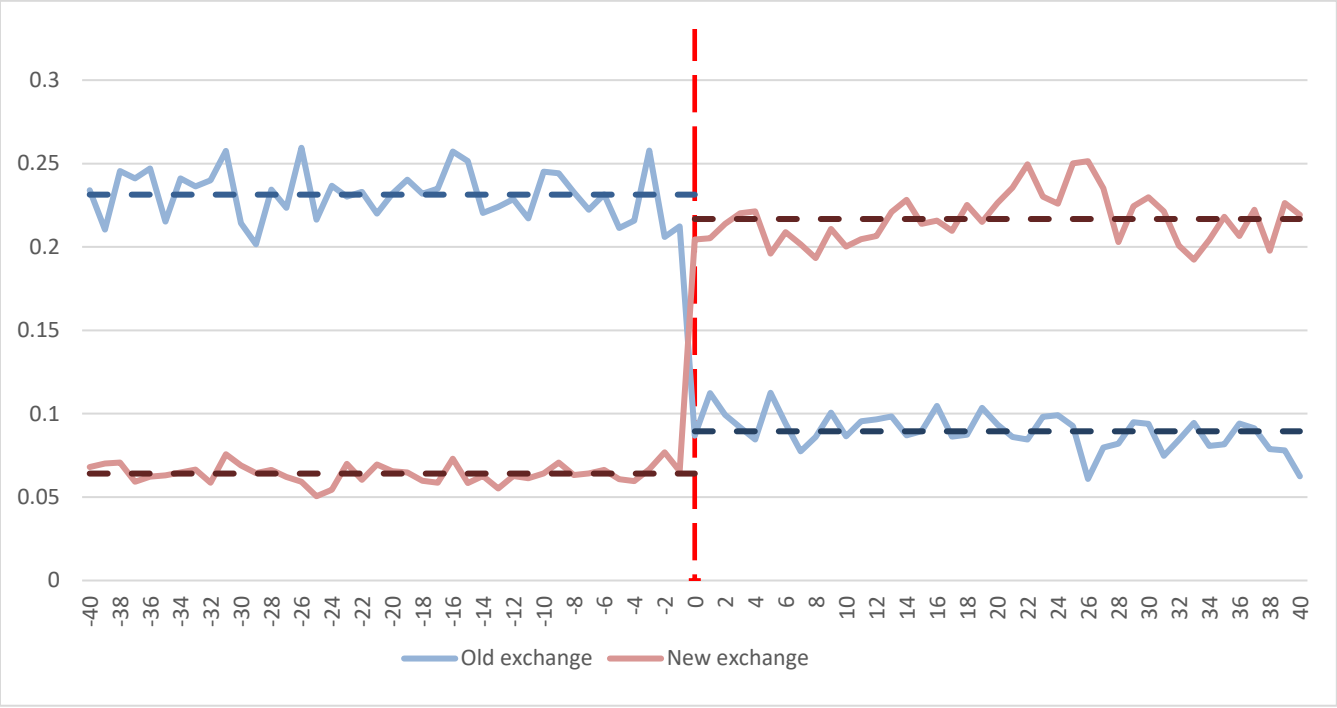


Figure 6: Market Share around Listing Changes

This figure shows the market share of the old listing exchange compared to the new listing exchange in the forty trading days around listing changes occurring from 2019 to 2024. The market share is in dollar volume and excludes opening, reopening, closing, and extended hours trades. The vertical line indicates the first day of the listing change.

Table 1: Listing Standards and Services

This table summarizes the listing standards and services offered by different stock exchanges, including NYSE, NASDAQ, and AMEX. It outlines key requirements such as minimum shareholders' equity, market value, and share distribution for firms to qualify for listing. Additionally, the table highlights various services provided by these exchanges to listed firms, such as marketing support, visibility initiatives, and corporate governance guidance. The listing criteria reflect regulatory, and market expectations aimed at ensuring transparency, investor protection, and market integrity.

	Listing Requirements	Services	Fees
NYSE (New York Stock Exchange)	$10M aggregate earnings (3 years) or $200M global market cap; minimum 400 shareholders and 1.1M public float; $4 minimum stock price.	Visibility support (media partners, bell-ringing, brand promotion); advisory on sustainability and governance; access to NYSE Pillar and trading metrics.	Initial listing ~$325K; annual fee scaled by shares; capped at $500K.
Nasdaq (Tiers: Global Select, Global Market, Capital Market.)	$11M earnings (Global Select) or alternatives based on market cap, revenue, or equity; share and float thresholds vary by tier. Other tiers have progressively lower listing standards.	Issuer relations (IR Insight), ESG tools, MarketSite exposure, free access to data and analytics platforms for select issuers.	Global tiers ~$295K; Capital Market ~$50K–$75K; annual fees vary by tier and shares outstanding.
NYSE Arca (Focus on Electronic listings, esp. ETFs and smaller firms.)	Tiered financial thresholds based on income, net worth, share price, and operating history; lighter governance onboarding for IPOs and switchers.	Market-maker incentives, media visibility, and access to event space.	Initial $55K–$75K depending on share volume; total capped at $250K.
NYSE American (Focus: Smaller and emerging growth companies.)	Multiple financial criteria options; 2-year operating history; low float and price thresholds.	Basic market access and compliance support.	Initial $50K–$75K; annual $60K–$80K.
CBOE BZX	Similar to Nasdaq (e.g., $4 price, 400+ shareholders, 1.1M float); includes ETF-specific rules.	Marketing and onboarding support, electronic market access, market surveillance tools.	Competitive; detailed ETF fee structures available but not fully disclosed in source.
IEX (Investors Exchange)	Listing program discontinued in 2022. Former requirement: Mirrored Nasdaq (e.g., $4 price, 400+ shareholders).	Legacy Services: Fee waivers, investor protection tools, speed bump innovation.	(Legacy) waivers.

Table 2: Sample Statistics

This table provides descriptive statistics on the sample we use for the cross-sectional analysis. Data are from Daily TAQ Trade and Master files. Panel A describes the number of securities and the listing exchange information for these securities during our sample period. We use codes 'A' (common stock) and 'H' (ADR common) in the TAQ Master file to identify stocks and we use code 'ETF' to identify ETFs. Panel B shows where stocks listing on each exchange trade in the dollar market share, where we focus on common stocks and ETFs. For the market share calculations, we keep all trades that have positive price and size and with trade correction indicator of 00 or 01. We then delete auctions, which are identified by sale condition codes of 'O', '6', or '5' and trades outside regular trading hours using the participant time. We aggregate the data within day, ticker, and trade location. All means are per day unless otherwise indicated. For each listing exchange shown in the column headers, we report the share of trading volume that occurs on the trading venues in the row labels.

Panel A: All Trades

		Year					
	All Years	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Mean # of Securities	10090.211	8448.595	8802.640	10523.012	11351.028	10782.000	10649.595
Mean # of Stocks	5546.167	5074.306	4968.545	5704.579	6151.637	5828.516	5556.353
Mean # of ETFs	2567.181	1977.675	2104.008	2385.052	2710.996	2912.660	3317.845
Mean # of Exchanges Trading	10.642	9.662	10.211	10.954	10.841	10.977	11.211
Mean # Stocks Listed on NYSE American	219.106	216.536	203.245	207.302	215.331	236.124	236.282
Mean # Stocks Listed on NYSE	2092.419	2173.028	1983.917	2150.468	2216.024	2061.472	1970.278
Mean # Stocks Listed on Nasdaq	3232.301	2681.091	2780.198	3343.254	3717.892	3529.900	3347.552
Mean # Stocks Listed on IEX	0.127	0.762	0	0	0	0	0
Mean # Stocks Listed on CBOE BZX	1.35	1.552	1.186	1.115	1.000	1.020	2.242
Mean # ETFs Listed on NYSE	6.296	0	0	0	0.131	7.192	30.460
Mean # ETFs Listed on NYSE Arca	1604.708	1325.667	1344.447	1491.778	1707.717	1797.716	1963.897
Mean # ETFs Listed on Nasdaq	463.809	361.218	400.7866	416.3492	463.2032	522.984	619.0278
Mean # ETFs Listed on CBOE BZX	492.368	290.790	358.7747	476.9246	539.9442	584.768	704.4603

Panel B: Exchange Pairs

	Listing Exchange					
Trading Exchange	**CBOE BZX**	**IEX**	**Nasdaq**	**NYSE**	**NYSE American**	**NYSE Arca**
NYSE American (A)	1.35	0.27	0.31	0.28	13.06	0.75
Nasdaq BX (B)	2.74	2.00	1.07	0.99	0.80	2.00
NYSE National (C)	2.41	0.86	0.82	0.93	0.72	1.78
Off-Exchange (D)	63.06	28.10	45.89	36.24	51.43	59.63
MIAX Pearl (H)	1.17	0.00	0.80	0.89	1.11	1.34
CBOE EDGA (J)	2.61	3.21	2.22	2.35	1.61	2.20
CBOE EDGX (K)	5.66	2.75	6.67	5.04	9.64	5.31
LTSE (L)	1.06	0.00	0.97	0.73	1.25	0.85
NYSE Chicago (M)	0.63	0.70	0.54	0.49	0.59	0.70
NYSE (N)	1.94	1.42	1.56	21.92	1.55	1.89
NYSE Arca (P)	9.62	4.52	7.38	5.33	9.06	21.95
Nasdaq (T or Q)	6.64	19.91	26.56	13.94	7.77	7.40
MEMX (U)	3.17	0.00	2.62	2.57	2.70	3.00
IEX (V)	2.91	27.69	3.99	4.64	2.23	2.50
Nasdaq PSX (X)	1.54	0.42	0.55	0.46	0.48	1.26
CBOE BYX (Y)	2.79	5.03	1.87	1.85	1.73	2.06
CBOE BZX (Z)	18.98	3.49	4.56	5.34	3.55	5.04

Table 3: Summary Statistics on Listing Changes

This tables provides descriptive statistics on the securities that changed their listing exchange during our sample period. We include stocks, common ADRs and ETFs in our sample. We identify listing changes when the TAQ Master file identifies a different listing exchange from one day to the next. Panel A shows how securities switched listing exchanges in terms of which listing exchanges lost listings to which listing exchange. Panel B shows the dollar market share of the old and new listing exchanges before and after the listing change takes effect. For the market share calculations, we keep all trades that have positive price and size and with trade correction indicator of 00 or 01. We then delete auctions, which are identified by sale condition codes of 'O', '6', or '5' and trades outside regular trading hours using the participant time. The market share is of the dollar volume.

Panel A: Listing Exchanges Before and After Listing Changes

Exchange Switching From	**Exchange Switching To**					
	CBOE BZX	**Nasdaq**	**NYSE**	**NYSE American**	**NYSE Arca**	**IEX**
CBOE BZX (Z)	n/a	8	3	0	16	0
Nasdaq (QT)	19	n/a	60	9	5	0
NYSE (N)	0	61	n/a	27	1	0
NYSE American (A)	0	15	14	n/a	0	0
NYSE Arca (P)	33	70	24	0	n/a	0
IEX (V)	0	1	0	0	0	n/a

Panel B: Market Share Before and After the Listing Change

		Old Listing Exchange		**New Listing Exchange**	
	Number	**Before Change**	**After Change**	**Before Change**	**After Change**
2019	68	20.89%	8.16%	5.13%	16.83%
2020	39	16.18%	4.87%	9.11%	19.30%
2021	52	20.09%	5.67%	6.79%	20.68%
2022	67	20.97%	6.19%	3.81%	15.88%
2023	67	21.93%	7.75%	3.53%	18.81%
2024	73	17.97%	6.31%	3.26%	16.10%
Total/Average	366	19.67%	6.49%	5.27%	17.93%

Table 4: Change in IBKR Market Share Around Listing Changes

This table documents the market share in IBKR for IEX and NASDAQ both before and after IBKR listed on IEX. The data come from TAQ and include an 81 trading day window before and after October 5, 2018 for the 2018 sample and an 81 trading day window before and after October 7, 2019 for the 2019 sample. In Panel A the table excludes correction records. Panel B further excludes opening, reopening, closing, and extended hours trades. Statistical significance is indicated by *, **, and *** for two-sided and white-corrected tests at the 1, 5, and 10% significance levels.

	2018 Sample: Nasdaq to IEX switch			2019 Sample: IEX to Nasdaq switch		
	Listing Exchange			Listing Exchange		
	Nasdaq	IEX	Change	IEX	Nasdaq	Change
Panel A: All Trades						
Share Vol (%)						
Nasdaq	43.35	15.31	-28.04***	17.87	36.31	18.44***
IEX	2.72	28.65	25.93***	35.38	4.78	-30.60***
$ Vol (%)						
Nasdaq	43.35	15.32	-28.03***	17.87	36.31	18.44***
IEX	2.72	28.65	25.93***	35.39	4.78	-30.61***
Num Trades (%)						
Nasdaq	41.71	20.83	-20.88***	24.81	37.36	12.56***
IEX	2.83	26.46	23.63***	28.18	4.51	-23.67***
Panel B: Excluding Opening, Reopening, Closing, and Extended Hours Trades						
Share Vol (%)						
Nasdaq	38.81	16.42	-22.39***	19.68%	30.70	11.02***
IEX	3.39	25.27	21.88***	28.95%	5.36	-23.60***
$ Vol (%)						
Nasdaq	38.81	16.43	-22.39***	19.71%	30.68	10.98***
IEX	3.40	25.27	21.87***	28.96%	5.357	-23.61***
Num Trades (%)						
Nasdaq	41.80	20.85	-20.95***	24.82%	37.39	12.57***
IEX	2.84	26.48	23.64***	28.20%	4.52	-23.68***

Table 5: Change in Spreads and Quote Aggressiveness in IBKR

This table shows the changes in quoted spreads, effective spreads, and quoted depth before and after the IBKR listing change from Nasdaq to IEX and from IEX to Nasdaq. The NBBO spread is the difference between the national best offer and the national best bid. It is measured in both dollars and bps, where the bps figures divide by the NBBO midpoint. Effective spreads are twice the absolute value of the trade price minus the NBBO midpoint. The Cum. NBBO Depth is the aggregated depth at the national best bid plus the aggregated depth at the national best offer, aggregating the depth from all exchanges that match the NBB and all exchanges that match the NBO. Matching NBB and NBO captures the propensity of the exchange to match the NBB and NBO. Alone at NBB and NBO captures the propensity of the exchange to be the only exchange setting the NBB and NBO. Not quoting captures times when the exchange is not displaying firm quotes. We apply the following filters: For trades, we exclude auctions and drop observations with sale condition codes of 'M', 'Q', '9,' 'B,' 'W,' 'Z,' and '4'. We also remove trades with non-positive prices or sizes and restrict to those with latency-adjusted timestamps between 9:30 a.m. and 4:00 p.m. and executing when NBBO quotes are not locked or crossed. For quotes, we retain only those timestamped between 9:30 a.m. and 4:00 p.m., those eligible for the NBBO, and when NBBOs that are not locked or crossed. In addition, quotes for which no trading occurred during their lifespan are given no weight in our volume-weighting. We use volume-weighted averages throughout—quotes are weighted by total daily trading volume, and effective spreads are weighted by trade size. Panel A provides market-wide statistics for all trading and quoting. Panel B examines trading and quoting on Nasdaq only. Panel C examines trading and quoting on IEX only. Averages are volume-weighted averages, which give more weight to quotes when share volume is heaviest and to effective spreads for larger trades. Statistical significance is indicated by *, **, and *** for two-sided and White-corrected tests at the 1%, 5%, and 10% significance levels, respectively.

	2018 Sample: Nasdaq to IEX switch			**2019 Sample: IEX to Nasdaq switch**		
	Listing Exchange			**Listing Exchange**		
	Nasdaq	**IEX**	**Change**	**IEX**	**Nasdaq**	**Change**
Panel A: All Trading and Quoting						
NBBO Spread (¢)	3.39	7.96	4.57***	8.71	5.79	-2.92***
NBBO Spread (bps)	5.72	15.05	9.32***	18.06	12.37	-5.69***
Eff spread (bps)	4.71	12.02	7.31***	13.93	8.86	-5.07**
Cum. NBBO Depth (lots)	11.23	10.47	-0.76	12.19	8.98	-3.21***
Panel B: Nasdaq Only						
BBO Spread (¢)	4.57	15.15	10.59***	12.73	7.11	-5.62***
BBO Spread (bps)	7.73	28.60	20.87***	26.32	15.15	-11.17***
Eff. Spread (bps)	4.61	10.84	6.23***	14.49	8.68	-5.81***
BBO Depth (lots)	6.66	3.74	-2.91***	4.99	5.32	0.33
Matching NBB (%)	78.46	51.82	-26.64***	69.43	76.49	7.06***
Matching NBO (%)	81.10	56.62	-24.48***	62.30	77.14	14.84***
Alone at NBB (%)	17.37	6.73	-10.64***	7.83	18.48	10.65***
Alone at NBO (%)	19.19	6.74	-12.45***	7.41	19.50	12.09***
Not Quoting (%)	0.00	0.00	0.00	0.08	0.00	-0.08
Panel C: IEX Only						
BBO Spread (¢)	29.42	10.03	-19.40	9.46	181.55	172.09***
BBO Spread (bps)	51.06	18.88	-32.18	19.53	382.54	363.02***
Eff. Spread (bps)	6.49	21.76	15.27***	14.63	3.92	-10.71***
BBO Depth (lots)	3.18	4.97	1.79***	5.67	6.41	0.74
Matching NBB (%)	11.25	66.64	55.39***	72.29	7.09	-65.19***
Matching NBO (%)	9.73	69.08	59.35***	70.77	6.09	-64.68***
Alone at NBB (%)	0.60	9.19	8.59***	7.59	0.43	-7.16***
Alone at NBO (%)	0.55	8.84	8.28***	10.26	0.38	-9.88***
Not Quoting (%)	71.94	0.00	-71.94***	0.01	0.01	0.00

Table 6: Listing Exchange Advantage

In this table, we show the results of the regression of equation 1 for various subsamples for the 2019 to 2024 sample period. Regressions are run for each day in a balanced panel of trading venue-security pairs. The dependent variable is the dollar market share of each exchange, and the key independent variable is an indicator for the listing exchange. The table summarizes the daily coefficients on the listing exchange indicator variable. The mean, median, standard deviation, minimum, and maximum are across the daily coefficients. The % of Significant Days indicates the percentage of days out of a total of 1510 trading days for which the coefficient is significant in a [two-sided test at the 1% level] in regressions that cluster standard errors by stock and exchange. The "all day including auctions" sample includes all trades in TAQ with correction indicator '00' and '01', with size >0 and with price >0. All subsequent samples are a subsample of this one. The "all day excluding auctions" sample also excludes trades with sale condition code of 'Om', '6', or '5'. The "Regular hours, 9:00-16:00, including auctions" sample includes only trades that had participant timestamp between 9:30am and 4:00pm. The "Regular hours, 9:00-16:00, excluding auctions" sample includes only trades that had participant timestamp between 9:30am and 4:00pm and that do not have a sale condition code of 'O', '6', or '5'. The "9:45-15:45, incl. auctions" sample excludes trades executed within 15 minutes of the open (9:30am) or the close (4:00pm), and the "9:45-15:45, excl. auctions" sample excludes trades executed within 15 minutes of the open (9:30am) or the close (4:00pm) as well as trades with condition codes of 'O', '6', or '5'. Panel A is estimated with trading across all exchanges and off-exchange while Panel B excludes off-exchange.

Panel A: Including Off-exchange Trading

Subsample	Mean	Median	Std. Dev.	Min	Max	% of Sig. Days	Mean Obs.
All day including auctions	21.69	21.36	1.91	18.98	35.96	100	134,383
All day excluding auctions	15.16	15.22	0.95	12.63	18.41	100	134,159
Regular hours, 9:00-16:00, including auctions	17.67	17.61	1.29	15.12	29.16	100	134,233
Regular hours, 9:00-16:00, excluding auctions	15.53	15.61	0.95	13.17	18.78	100	134,071
9:45-15:45, incl. auctions	13.39	13.55	1.35	10.69	24.94	100	133,338
9:45-15:45, excl. auctions	13.34	13.55	1.17	10.69	17.58	100	133,336

Panel B: Excluding Off-exchange Trading

Subsample	Mean	Median	Std. Dev.	Min	Max	% of Sig. Days	Mean Obs.
All day including auctions	39.59	39.16	2.45	35.56	56.68	100	132,649
All day excluding auctions	30.19	30.15	0.93	27.69	34.18	100	131,943
Regular hours, 9:00-16:00, including auctions	33.82	33.62	1.54	30.78	46.37	100	132,336
Regular hours, 9:00-16:00, excluding auctions	30.19	30.15	0.94	27.68	34.34	100	131,719
9:45-15:45, incl. auctions	27.02	27.00	1.54	24.05	41.11	100	129,737
9:45-15:45, excl. auctions	26.95	27.00	1.25	24.05	32.62	100	129,731

Table 7: Listing Exchange Advantage by Market Capitalization and Trading Activity

In this table we present results from regressions measuring the listing exchange trading advantage (equation 1) run separately for each decile for the subsample that excludes TAQ trades with participant timestamps before 9:45am or after 3:45pm as well as TAQ trades with sale condition codes of 'O', '6', or '5' over the 2019 to 2024 sample period. Regressions are run for each day in a balanced panel of trading venue-security pairs. The dependent variable is the dollar value market share of each exchange, and the independent variable is an indicator for the listing exchange. The table summarizes the daily coefficients on the listing exchange indicator variable. The mean, median, minimum and maximum are across the daily coefficients. The % of Sig. Days indicates the percentage of days out of a total of 1,510 trading days that the coefficient is significant in regressions that cluster standard errors by stock and exchange. Panel A shows the listing premium for deciles by market capitalization. Panel B shows the listing premium for declines by trading activity (number of trades per day). Panel C shows the listing premium for subsets of securities as indicated.

Panel A: Market Capitalization

Decile	Mean	Median	Std. Dev.	Min	Max	% of Sig. Days	Mean Obs.
1 (Smallest)	16.05	16.35	2.22	10.30	24.68	100	12,178
2	13.31	13.29	1.32	9.70	20.29	100	13,134
3	12.76	12.76	1.16	9.54	17.87	100	13,194
4	13.29	13.29	1.36	10.34	19.01	100	13,156
5	13.45	13.51	1.53	10.19	19.77	100	13,562
6	13.50	13.54	1.22	10.81	17.89	100	13,520
7	13.49	13.67	1.21	10.82	13.49	100	13,600
8	13.37	13.44	1.14	10.57	18.02	100	13,638
9	12.32	12.32	1.12	9.78	16.86	100	13,655
10 (Largest)	11.91	12.03	1.17	8.88	16.28	100	13,684

Panel B: Trading Activity

Decile	Mean	Median	Std. Dev.	Min	Max	% of Sig. Days	Mean Obs.
1 (Fewest trades/day)	21.02	21.05	2.63	13.99	30.93	100	11,389
2	15.25	15.22	1.61	11.23	22.34	100	13,177
3	13.29	13.44	1.49	9.47	18.33	100	13,353
4	12.52	13.03	1.68	9.04	17.53	100	13,451
5	12.50	12.98	1.75	8.42	16.91	100	13,562
6	12.52	12.96	1.58	8.99	17.80	100	13,624
7	12.71	12.82	1.27	9.84	17.83	100	13,672
8	12.19	12.15	1.11	9.53	16.50	100	13,689
9	10.98	10.95	0.94	8.18	14.80	100	13,701
10 (Most trades/day)	9.18	9.00	0.97	7.59	13.42	100	13,720

Panel C: Extremes

	Mean	Median	Std. Dev.	Min	Max	% of Sig. Days	Mean Obs.
Magnificent 7	19.92	19.71	3.45	13.10	29.71	100%	117
S&P500	12.65	12.48	1.51	9.50	17.74	100	8,599
non-S&P500	13.87	13.90	1.44	11.30	19.34	100	82,663
Optionable Securities	13.31	13.52	1.18	10.64	17.52	100%	131,839
Non-optionable Securities	15.11	15.81	4.80	2.44	42.80	92%	1,497

Table 8: Listing Exchange Advantage by Security Type, and Listing Exchange

In this table, we present results from equation (1) regressions measuring the listing exchange advantage run separately for partitions based on listing exchange and security type. We use codes 'A' (common stock) and 'H' (ADR common) in the TAQ Master file to identify stocks and we use code 'ETF' to identify ETFs. Listing exchange is from the TAQ Master file. The partitions include: All regressions include market share figures for the subsample that excludes TAQ trades with participant timestamps before 9:45am or after 3:45pm as well as TAQ trades with sale condition codes of 'O', '6', or '5' over the 2019 to 2024 sample period. Regressions are run for each day in a balanced panel of trading venue-security pairs. The dependent variable is the dollar value market share of each exchange, and the independent variable is an indicator for the listing exchange. The table summarizes the daily coefficients on the listing exchange indicator variable. For the "*NYSE and Nasdaq only*" partition, exchange fixed effects are omitted to avoid absorption of the listing exchange indicator. The mean, median, standard deviation, minimum and maximum are across the daily coefficients. The % of Sig. Days indicates the percentage of days out of a total of 1,510 trading days that the coefficient is significant in regressions that cluster standard errors by stock and exchange.

Partition	Mean	Median	Std. Dev.	Min	Max	% of Sig. Days	Mean Obs.
Common Stocks							
listed on Nasdaq	25.57	25.65	2.12	21.14	32.67	100	53,231
listed on NYSE	19.50	19.46	1.36	15.86	25.14	100	34,400
listed on NYSE/Amex	9.80	8.84	2.84	6.07	19.55	82	3,621
listed on NYSE/Arca	38.30	33.00	27.14	0.00	106.25	58	42
ETFs							
listed on CBOE/BZX	14.20	14.83	2.55	8.81	26.52	100	8,074
listed on Nasdaq	14.64	14.44	1.64	10.17	22.15	100	7,619
listed on NYSE/Arca	17.67	18.01	2.04	12.80	24.23	100	26,274
listed on NYSE	12.42	12.12	3.30	5.45	26.96	73	480
NYSE and Nasdaq only							
All	15.23	15.17	1.08	13.02	20.01	100	11,524
Common Stocks	15.43	15.38	1.13	13.04	20.14	100	10,594
ETFs	12.85	12.69	1.52	8.51	21.86	84	930

Table 9: Market Share Before and After Listing Exchange Changes

In this table, we show the results of the regression of equation 2 for the sample of stocks that switched their listing exchange during the 2019 to 2024 sample period. Regressions are run for each day in a balanced panel of trading venue-security pairs for the 40 trading days before and after the listing change. The dependent variable is the dollar market share of each exchange, measured in percentages, and the independent variables are indicators for the old listing exchange and the new listing exchange and interactions of those indicators with an indicator for after the switch. The table reports the coefficients on each indicator variable. The sample includes all trades in TAQ with correction indicator '00' and '01', with size >0 and with price >0 and participant timestamps on or after 9:45am and on or before 3:45pm, except trades with sale condition code of 'O', '6', or '5'. The table shows the results for the full sample period and broken out by year. Listing changes that occur within 40 days of the beginning or end of the year are included in the year of the listing change, except for listing changes that occur within 40 days of the end of 2024, which are excluded. Standard errors are presented in parentheses. Statistical significance is indicated by *, **, and *** for two-sided and white-corrected tests at the 1, 5, and 10% significance levels.

Coefficient	Full Sample	2019	2020	2021	2022	2023	2024	Tape B to B
Old Listing Exchange	11.00***	8.39***	9.36***	12.16***	12.40***	12.17***	12.28***	12.04***
	(0.53)	(0.94)	(0.95)	(1.16)	(1.20)	(1.35)	(1.46)	(1.33)
New Listing Exchange	0.41	-0.51	3.33***	0.06	-0.33	0.25	0.12	3.45***
	(0.25)	(0.70)	(0.91)	(0.61)	(0.50)	(0.45)	(0.56)	(0.44)
Old Listing Exchange*Post-switch	-9.23***	-8.31***	-8.39***	-11.15***	-11.18***	-9.68***	-8.91***	-7.89***
	(0.48)	(1.41)	(0.99)	(1.01)	(1.14)	(1.17)	(1.28)	(1.21)
New Listing Exchange*Post-switch	8.64**	12.43***	1.94*	9.96***	9.92***	10.09***	10.23***	6.61***
	(0.48)	(1.95)	(1.14)	(1.05)	(0.94)	(0.91)	(0.86)	(1.00)
Security FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exchange FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs	522,860	77,296	87,832	70,400	92,251	108,927	86,154	64,390
Adj R-squared	0.529	0.474	0.575	0.657	0.501	0.462	0.626	0.566

Table 10: Change in Spreads and Quote Aggressiveness around Listing Changes

This table shows the changes in quoted spreads, effective spreads, quoted depth, and quote aggressiveness before and after the listing changes for a sample of listing changes from 2019 to 2024. The NBBO spread is the difference between the national best offer and the national best bid. It is measured in both dollars and bps, where the bps figures divide by the NBBO midpoint. Effective spreads are twice the absolute value of the trade price minus the NBBO midpoint. The Cum. NBBO Depth is the aggregated depth at the national best bid plus the aggregated depth at the national best offer, aggregating the depth from all exchanges that match the NBB and all exchanges that match the NBO. Matching NBB and NBO captures the propensity of the exchange to match the NBB and NBO. Alone at NBB and NBO captures the propensity of the exchange to be the only exchange setting the NBB and NBO. Not quoting captures times when the exchange is not displaying firm quotes. We apply the following filters: For trades, we exclude auctions and drop observations with sale condition codes of 'M', 'Q', '9,' 'B,' 'W,' 'Z,' and '4'. We also remove trades with non-positive prices or sizes and restrict to those with latency-adjusted timestamps between 9:30 a.m. and 4:00 p.m and executing when NBBO quotes are not locked or crossed. For quotes, we retain only those timestamped between 9:30 a.m. and 4:00 p.m., those eligible for the NBBO, and when NBBOs that are not locked or crossed. In addition, quotes for which no trading occurred during their lifespan are given no weight in our volume-weighting. We use volume-weighted averages throughout—quotes are weighted by total daily trading volume, and effective spreads are weighted by trade size. Panel A provides market-wide statistics for all trading and quoting. Panel B examines trading and quoting on the old listing exchange only. Panel C examines trading and quoting on the new listing exchange only. Averages are volume-weighted averages, which give more weight to quotes when share volume is heaviest and to effective spreads for larger trades. Statistical significance is indicated by *, **, and *** for two-sided and white-corrected tests at the 1, 5, and 10% significance levels.

	Before Switch	After Switch	Change
Panel A: All Trading and Quoting			
NBBO Spread (¢)	2.26	3.07	0.81***
NBBO Spread (bps)	16.88	13.78	-3.10
Eff spread (bps)	14.51	11.09	-3.43**
Cum. NBBO Depth (lots)	313.00	363.96	50.96
Panel B: Old Listing Exchange Only			
BBO Spread (¢)	7.46	68.11	60.65***
BBO Spread (bps)	39.24	172.59	133.35***
Eff. Spread (bps)	13.93	11.27	-2.66**
BBO Depth (lots)	100.24	43.06	-57.18***
Matching NBB (%)	77.79	55.72	-22.07***
Matching NBO (%)	77.41	56.96	-20.44***
Alone at NBB (%)	6.65	4.90	-1.76***
Alone at NBO (%)	6.50	4.85	-1.65**
Not Quoting (%)	0.05	8.55	8.50***
Panel C: New Listing Exchange Only			
BBO Spread (¢)	20.84	10.50	-10.35***
BBO Spread (bps)	144.05	49.87	-94.18***
Eff. Spread (bps)	10.16	9.57	-0.59
BBO Depth (lots)	70.76	42.65	-28.11***
Matching NBB (%)	66.88	70.35	3.46*
Matching NBO (%)	66.76	71.25	4.49***
Alone at NBB (%)	2.80	7.97	5.17***
Alone at NBO (%)	2.83	7.11	4.28***
Not Quoting (%)	6.69	0.04	-6.64***