Habitats and Return Comovement: Evidence from Firms that Switch Exchanges

Aditya Kaul
University of Alberta
Edmonton, Canada T6G 2R6

Vikas Mehrotra
University of Alberta
Edmonton, Canada T6G 2R6

Carmen Stefanescu
University of Alberta
Edmonton, Canada T6G 2R6

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All three authors are from the Department of Finance and Management Science, School of Business, University of Alberta, Edmonton, AB T6G 2R6. Aditya Kaul can be contacted at 780–492–5027 or at aditya.kaul@ualberta.ca; Vikas Mehrotra can be contacted at 780-492-2976 or at vmehrotr@bus.ualberta.ca; Carmen Stefanescu can be contacted at 780–430–0583 or at carmens@ualberta.ca.

Abstract

Each year a number of NASDAQ firms that are eligible to move to the NYSE choose to do so. We study return and trading comovement for this group of firms in order to understand the link between trading venue and comovement. Our tests focus on 557 NASDAQ firms that move to NYSE between 1988 and 2000. We measure the change in comovement for these stocks with the NASDAQ and NYSE market returns and find increased comovement with NYSE market returns and decreased comovement with NASDAQ market returns. While cash flow (fundamentals) comovement is unaffected by the switch, there is a large increase in the comovement of the stock's trades with NYSE trades, and a corresponding decrease with NASDAQ trades. These differences are large in relation to those for a control sample of firms matched on size and industry but choose to remain on NASDAQ. Finally, residual return comovement, obtained by removing the influence of order imbalance on returns, displays weaker comovement with residual market-wide returns. These results are at odds with the fundamentals based explanation for comovement, and instead support a habitat-based model of comovement proposed by Barberis, Shleifer and Wurgler (2005).

1 Introduction

Comovement in stock returns, or the behavior that prices exhibit to move together, has direct implications in the field of asset pricing but it has remained a relatively unexplored and controversial area in financial research. The classical explanation of stock returns comovement as a response to common or market-wide information has been increasingly challenged by a number of empirical studies that argue that stock returns move together excessively relative to their fundamental information flow.[1] Excess comovement is defined as the comovement or correlation between stock returns that can not be explained by the correlation in their fundamentals.

This paper contributes to the emerging literature on return comovement. We analyze the returns behavior for the group of firms that move their listing from one exchange to another, more specifically from NASDAQ to NYSE. This sample constitutes an excellent experiment to study models of comovement for the following reasons. The NASDAQ and NYSE markets dominate U.S. equity trading, the two markets are highly integrated, have synchronous trading hours, and today each has about half of the market share in trade execution services. More importantly, during our sample period, not all firms that could migrate to the NYSE chose to do so, leaving us with a substantial sample of control firms that are similar in size to the migrating firms but have chosen to remain listed on NASDAQ. This control sample allows us to isolate the impact of a change in habitat, and not merely a change in the complexion of the migrating securities that may in itself attract new clienteles. This natural control makes our inferences more robust.

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[1] A partial list of recent work in this area includes Barberis, Shleifer and Wurgler (2005, hereafter BSW), Pindyck and Rotemberg (1993), Kumar and Lee (2006), Greenwood (2006), and Feng and Seasholes (2004). The general thrust of this literature is that non-fundamental factors such as liquidity and sentiment affect comovement of asset prices in various markets.

Our sample consists of 557 NASDAQ firms that move to the NYSE between 1988 and 2000. Following Barberis, Shleifer and Wurgler (2005), we measure changes in comovement from a regression of the stock return on NASDAQ and NYSE market returns. We restrict our sample to stocks that have price data for one year before and two years after the switch.

Our main results are as follows. After the stock moves from NASDAQ to the NYSE, it experiences increased comovement with the NYSE market return and decreased comovement with the NASDAQ market return. This finding is similar to Barberis, Shleifer and Wurgler (2005) who show that stocks added to the S&P 500 index experience an increase in their betas with that index and a decrease in their betas with the rest of the market. Second, a control sample of firms matched on size and industry that stayed listed on the NASDAQ does not experience a significant change in beta with either the NYSE market return or the NASDAQ market return.

In contrast to the S&P additions, a change in listing venue from NASDAQ to NYSE is unlikely to be affected by certification effects that plague S&P additions (despite claims by the S&P Corporation that additions to their widely followed index are based solely on publicly available criteria). In fact, Denis et al (2003) find evidence of higher earnings for stocks added to the S&P index, and the literature on the price effects of S&P additions is not unambiguously clear on ruling out certification effects associated with the event. By contrast, our sample of firms migrating from one premier U.S. exchange to another is unlikely to be associated with information effects, in particular because the firms must apply to migrate rather than being selected to do so by the NYSE. Moreover, we do not have any reason to expect herding by institutions because of a change in trading venue, in contrast to S&P additions where indexers are forced to buy the newcomer in concerted trades.

Our findings help us in differentiating among the potential explanations for returns comovement. There are two broad theories of comovement. The traditional view (in a frictionless world with rational investors) holds that return comovement is solely due to comovement in fundamentals (e.g. cash flows). Barberis et al (2005) suggest alternative explanations for return comovement based on market friction, sentiment and limits to arbitrage. In an earlier work, Barberis and Shleifer (2002) propose that investors simplify their asset allocation procedure by first compartmentalizing assets into broad *categories*, and allocate funds at the level of these categories (and not at the individual security level). Their coordinated demand driven by correlated sentiment induces comovement in the returns grouped in the same category.

A similar view of comovement is based on the observation that investors form clienteles or *habitats* within which they locate their trades, perhaps because of transaction costs, trading restrictions or lack of information about other habitats (see also Merton, 1987). The habitat view, as does the category view of comovement, confines investors to choose to trade only a subset of available securities. This view predicts that investors' preference towards a trading habitat will induce comovement in the stock returns of these securities, partiuclary if a subset of these investors comprises noise traders with correlated sentiment.

Finally, BSW propose a third model of comovement based on differential speeds of *information diffusion.* Due to market frictions, some stocks will incorporate information more quickly in their prices than others. Under this approach, for example, some stocks may be held by investors with better access to news or with better means to use it. This type of investors may represent a common factor that could induce comovement in returns. By measuring returns over longer intervals, it may be possible to attenuate the effects on comovement of a class of securities that have similar rates of information assimilation.

Our findings suggest that there are common exchange-specific factors in the returns for stocks. After a stock moves to another exchange, it will comove more with stocks on the new exchange and less with stocks on the old exchange. When we examine comovement in order imbalances (a proxy for trading) for the switching stocks and the market, we find that order imbalance for these stocks comoves more with NYSE order imbalance and less with NASDAQ imbalance. Previous studies found that there is no significant change in operating performance after the switch; therefore we do not expect a significant change in cash flow comovement for these firms. Indeed, we do not find any evidence that firms switching to the NYSE experience an increase in their cash flow (fundamental) comovement with the NYSE stocks.

We eliminate the possibility of a category explanation to returns comovement. Since our matching sample matches on industry and market capitalization, they are as good as a candidate for being listed on NYSE as the event stocks. The fact that this sample does not exhibit the same increase (decrease) in the beta with NYSE (NASDAQ) suggests that comovement is due to other friction or sentiment based explanations and not to firm characteristics or industry. It shows that the change in sensitivity with the market is related to the listing location. Our findings are most consistent with the hypothesis of a habitat model of comovement.[2]

We recognize that order imbalance may not be the sole reason for return comovement with the NYSE index after a firm switches to the NYSE. To address this issue, we remove the effects of order imbalance on returns, and use the residuals to re-estimate comovement with

[2] Piotrosky and Roulstone (2002) find that analysts and institutional investors increase the ability of industry-level information to explain firm-level stock returns. Hotchkiss and Strickland (2003) also show that institutional ownership composition affects stock price behavior around earnings announcements.

the NYSE and NASDAQ. We find much lower levels of comovement with the non-trading NYSE and NASDAQ returns, lending further support to the habitat model of comovement.

The rest of the paper is organized as follows: section 2 provides the background information on NASDAQ and NYSE, the process of listing on NYSE, and previous findings related to exchange listings; section 3 provides an overview of the theories of comovement, and describes the hypotheses to be tested in this study; section 4 presents the data and methodology; section 5 provides the empirical findings; and section 6 concludes.

2 Literature review

2.1 Listing on the NYSE

NYSE and NASDAQ have structures and governing principles that are different. NYSE is a specialist based market and, since its formation, has been the dominant institution in the U.S. securities exchange industry. Its most important competitor came in 1970 with the creation of NASDAQ, an automated over-the-counter dealer market. NASDAQ was formed as an exchange tailored to small firms that want wider access to capital markets. NASDAQ is a computer-based dealer market and any individual or firm that meets the minimum standards for market making may act as a dealer as opposed to the NYSE specialist that has monopoly power in trading.

NASDAQ grew rapidly and through its organizational characteristics (the lack of monopolistic power of any dealer, use of technology to speed up transactions, lower operation costs and consequently lower listing fees) it reduced the importance of the NYSE. Over time, several large firms on NASDAQ have switched to NYSE, but although the market is almost perfectly split between the two, NASDAQ has remained an exchange for smaller firms. On the other hand, NYSE has imposed stringent rules against delisting (rule 500) and there have been virtually no switches in firm listings between the NYSE and NASDAQ. In November 1997, rule 500 was changed so as to allow NYSE listed firms to move to a different exchange. Nevertheless, since then, only one firm has chosen to move to NASDAQ while six others have chosen a dual listing (all in 2004)[3].

[3] Of these six firms, at the end of 2005, two dropped their NYSE listings and traded on NASDAQ alone, and the other four dropped their NASDAQ listing and traded in their original market, the NYSE. Therefore, the dual listing program initiated by NASDAQ has not proved successful.

NASDAQ has been aggressive in its reforms to improve and speed trading, but some studies note that investors, and especially large, institutional investors, with their price sensitive orders, may prefer physical trading strategies that allow for a quicker adjustment of strategies depending on market conditions. Although NYSE continues to attract firms from other exchanges, the number of companies choosing to switch exchanges has declined, and an increasing number of large NASDAQ firms that are eligible to list on NYSE have chosen to remain on NASDAQ. However, having a low number of firms moving to NYSE doesn't say the entire story, as it is possible to obtain information only for the firms that have been granted an NYSE listing, and not for those applying for a listing. Therefore it is difficult to conclude if relatively few firms apply to switch or if relatively few firms are accepted by the NYSE.

The conditions that a firm must satisfy to apply for an NYSE listing include minimum levels for the pre-tax income in the preceding two years, net tangible assets, aggregate market value of publicly held shares, shares publicly held, and number of holders. However, satisfying these minimum requirements does not result in automatic acceptance by the exchange. The approval of an application is at the discretion of the exchange, which also considers the applicant's reputation, growth pattern, and earnings power. Nevertheless, prior to filing a formal application, virtually all firms undergo a confidential preliminary review by the exchange. This evaluation insures that all firms that file a formal application are successful in obtaining listing approval. Approximately four weeks after the firm has filed its formal application, the exchange will publish the decision[4] in its Weekly Bulletin in the week in which approval is granted.

[4] The shares become eligible for trading 30 days after the NYSE notifies the SEC that it has received the registration statement and has approved the firm's listing application.

2.2 Empirical findings in prior work

There is a considerable body of research on stock listings. The literature on how optimal listing may benefit shareholders suggests that increases in firm value may result from both non-economic and economic factors, although the bulk of the literature focused on economic factors.

A number of studies suggest that firms choose to list on markets that maximize visibility. Increased visibility may lead to increased demand for a firm's stock, resulting in higher value. Surveys of managers (Baker and Johnson, 1990) suggest that the most important reasons for firms switching exchanges are increased prestige and visibility. Merton (1987) provides evidence supporting the relationship between listing and visibility. Kadlec and McConnell (1994) suggest that investor recognition is an important determinant of a firm's decision to switch from NASDAQ to the NYSE. Baker and Johnson (1990) suggest that there is a relationship between firm value and the visibility and prestige offered by the market. They find that as the AMEX's standing declined in the 1980's, visibility and prestige also declined as motives for a firm seeking a listing on AMEX.

Earlier work argued that because firms moving from NASDAQ to the NYSE or the AMEX, or from AMEX to NYSE, have to meet more stringent criteria, a switch is considered to provide a positive signal about the firm's prospects (Baker and Johnson, 1990 and Van Horne, 1970). Nevertheless, the post-listing stock price performance has been shown to be poor with every study reporting negative and significant abnormal returns. Ule (1937) reports that the prices of the switching stocks fall relative to industry indexes. Van Horne (1970) and Ying et al (1977) obtain similar results. McConnell and Sanger (1987) find negative and significant market-adjusted abnormal returns within 1 year for 2482 firms that move onto the NYSE between 1926 and 1982. Dharan and Ikenberry (1995) document significant 3-year underperformance for firms switching their stock trading to the AMEX or NYSE during 1962-1990 (compared to size-matched reference portfolios), or 1973-1990 (compared to size and book-to-market-matched reference portfolios). Lin (2003) documents three-year underperformance for switching firms during 1990-1997.

Different explanations have been given for this finding. McConnell and Sanger (1987) examine several possibilities, including the issuance of new shares shortly following the switch, stock selling by insiders, correction of 'overreaction' to the listing announcement but none can explain the post-listing results. Dharan and Ikenberry (1995) suggest that poor post-listing performance is caused by the overreaction of investors. Fama (1998) disagrees, arguing that listing should be a signal that the firm is under-valued. Webb (1999) suggests that managers time their listings around a peak of stock performance. Lin (2003) tries to use pre-listing discretionary current accruals to explain subsequent stock returns.

Several studies suggest a lower cost of equity capital (that may vary across exchanges) may be the driving factor behind listing changes. Dhaliwal (1980) finds that equity capital costs are lower for companies whose stocks trade on the floors of the AMEX and the NYSE than for those that trade on the NASDAQ. Baker and Spitzfaden (1982) argue that Dhaliwal's results are biased by the inclusion of OTC stocks in the set of NASDAQ stocks.

The largest body of the literature is dedicated to issues related to market quality, including the speed of trade execution, price efficiency, volume, volatility, transaction costs measured by bid-ask spreads, all known to be dependent on an exchange's microstructure. Some studies assume that market quality, measured by trading costs, is the primary determinant of exchange listing. Grammatikos and Papaioannou (1986) consider that investors value low trading costs, and firms should be listed on markets where their shares will be most liquid. Amihud and Mendelson (1986) suggest that lower transactions costs will increase firm value because they increase the demand for a stock. Bessembinder (2002) argues that trade execution costs are adequate proxies for comparing exchange efficiency, which in turn can be used to predict the listing decisions of firms.

Transaction costs measured by bid-ask spreads are found to be larger on NASDAQ than on NYSE. Clyde, Schultz and Zaman (1997) and Tse and Devos (2004) examine stocks that switch from the AMEX to NASDAQ. Both found that while spreads double after listing on NASDAQ, the market nevertheless views switches from the AMEX to the NASDAQ as positive. To better understand why the market may view higher transaction costs as positive, Tse and Devos (2004) investigate the effect of the switch on volume and volatility and find that firms that move to NASDAQ from AMEX experience both higher volume and higher volatility. Huang and Stoll (1996) compare trade execution costs of large capitalization NASDAQ stocks to those of comparable NYSE stocks using data from 1991 and find that the intra-day bid-ask spread on NASDAQ are generally twice as large as they are on NYSE. Bessembinder and Kaufman (1997) extend the analysis to smaller firms and find that the NYSE's advantage in trade execution costs is even more significant for small firms and small trades. Christie and Huang (1994) compare firms that move from NASDAQ to NYSE and report a substantial reduction in trade execution costs.

Other studies provide evidence to support the idea that in fact trading costs are not lower on the NYSE. Chan and Lakonishok (1997) limit their analysis to institutional investors and find no evidence to suggest that trading costs on the NYSE are uniformly lower than on NASDAQ. They find that for firms below $1.2 billion in market capitalization in 1991, institutional trading costs are lower on the NASDAQ. At the same time, they find a cost advantage on the NYSE for trades of firms with market capitalization above $4.5 billion in 1991. They also speculate that with commission rebates, any trade advantage for either market is small. Chan and Lakonishok also point out that spreads are a more relevant measure of trading costs for small traders than for institutional traders, who are in a better position to negotiate with dealers and thus trade within the quoted spreads. In 1991, 49.6% of the reported volume on the NYSE consisted of block trades (transactions of 10,000 or more shares). The significant amount of block trading, which measures institutional activity, may distort the degree of significance of the results reported by studies that use trading costs to compare the NYSE and the NASDAQ.

3 Comovement

3.1 Theories of comovement

Common factors have been shown to exist in the returns for small-cap stocks, value stocks, closed-end funds, stocks in the same industry, bonds of same rating and maturity, stocks within same national markets. The studies have mainly examined the sensitivities of asset returns to common factors, but little work has been done to understand why these common factors exist.

There are two broad theories of comovement. The first, set in a world with no frictions and populated by rational investors, asserts that comovement in prices is due to comovement in fundamentals. The second approach, as explicated by Barberis et al (2005), relaxes these assumptions and suggests that friction-based and sentiment-based factors de-link the comovement in prices from the comovement in fundamentals. Barberis et al (2005) provide three rationales for this second theory of comovement.

The *category view* suggests that investors categorize assets and allocate the funds at the level of these categories and not at the individual asset level. Their coordinated demand driven by correlated sentiment will induce common factors in the returns grouped in the same category. The *habitat view* suggests that transaction costs, trading restrictions or lack of information will lead investors to trade only a subset of available securities. This preference for a trading habitat will induce a common factor in stock returns. The *information diffusion view* asserts that due to market frictions, the prices of some stocks will incorporate information more quickly than those of others. Under this approach, return comovement is induced by a common factor in the returns of stocks that incorporate information at similar rates.

Studies provide evidence to support friction or sentiment-based comovement theory. Vijh (1994) studies stocks that are added to the S&P 500 index and finds that these stocks experience a significant increase in their betas on the value-weighted return on NYSE and AMEX. This finding contradicts the fundamentals view of comovement, as inclusion in the S&P 500 index should not be associated with changes in stock fundamentals. Consequently, the increase in betas might be better explained through the friction or sentiment- based view. The popularity of S&P based investment products makes S&P stocks a preferred category or habitat for some investors, and their correlated flows could generate the increased correlation of the newly added stock with other stocks in the index. The information diffusion view could also explain Vijh's (1994) finding: if S&P stocks are held by investors with better access to news, prices will incorporate new information at a faster rate.

Barberis et al (2005) revisit the issue of S&P additions and provide new evidence to support the friction or sentiment based theory of comovement. Their analysis examines the effects of index addition on betas on both the S&P index and a non-S&P index (capturing the influence of the rest of the market), and shows that an added stock's S&P beta goes up while its non-S&P beta goes down.

Other papers provide evidence to support friction or sentiment-based comovement. Froot and Dabora (1999) suggest that the returns to so-called 'Siamese twins', e.g. Royal Dutch (listed in U.S.) and Shell (listed in UK), are delinked. These returns should be perfectly correlated, but actually display excess comovement with the local index, e.g. Royal Dutch with S&P 500 and Shell with the FTSE index. Hardouvelis et al. (1994) and Bodurtha et al. (1995) show that closed-end country funds, whose assets trade in a different location from funds themselves, comove more with the stock market in the country where they are traded than with the stock market in the country where their assets are traded. Lee et al. (1991) find that domestic closed-end funds comove with small-cap stocks even when their asset holdings consist of large cap stocks. Pindyck and Rotemberg (1990) document comovement in the prices of seven major commodities (wheat, cotton, copper, gold, crude oil, lumber, cocoa) chosen to be as independent of one another as possible. Fama and French (1995) show that it is hard to connect the strong common factors in the returns of value stocks and small stocks to common factors in news about earnings. Thus, there appears to be comovement in returns that has little to do with comovement in news about fundamentals.

A number of studies examine whether index inclusion has an effect on price levels. Harris and Gurel (1986), Shleifer (1986), Lynch and Mendenhall (1997), and Wurgler and Zhuravskaya (2002) find strong price effects for S&P 500 inclusions, while Kaul et al. (2000) and Greenwood (2004) find similar effects for the Toronto Stock Exchange and Nikkei indices. This literature argues that uninformed demand affects price levels.

We provide further evidence on friction or sentiment – based comovement by analyzing the returns for firms that switch their trading location from NASDAQ to NYSE. Our multivariate regression tests show that after a stock switches to its new trading location, its NYSE beta increases while its NASDAQ beta decreases. We also show that similar stocks that could move to NYSE but choose to remain on NASDAQ do not exhibit similar patterns in return comovement. These results cast doubt on the possibility that the move to the NYSE coincides with a change in the correlation between stocks' fundamental values.

3.2 Hypotheses development

Our approach is to uncover patterns in market reaction to the change of listing location. We define our hypothesis as follows:

Once a stock j, previously listed on NASDAQ, starts trading on NYSE, its returns will comove more with NYSE market returns and less with NASDAQ market returns. Thus, the following bivariate regression will yield an increase in the NYSE beta estimate, β_j^{NYSE}, and a decrease in the NASDAQ beta estimate, β_j^{NASDAQ}:

$$\Delta P_{j,t} = \alpha_j + \beta_j^{NYSE} \Delta P_t^{NYSE} + \beta_j^{NASDAQ} \Delta P_t^{NASDAQ} + \varepsilon_{j,t} \tag{1}$$

However, this bivariate regression for a similar stock *i* (matched on industry and size), listed on NASDAQ and continuing to trade on NASDAQ, should yield no change in either β_i^{NYSE} or β_i^{NASDAQ} after the matched event date. A similar stock trading on NASDAQ, and which does not switch to the NYSE, should display unchanged comovement with NASDAQ and NYSE market returns.

4 Data

4.1 Test sample

Using the Center of Research in Security Prices (CRSP) data, we select NASDAQ–listed common stocks that move to the NYSE between January 1988 and December 2002. We include only ordinary common stocks and exclude non–U.S. firms, real estate investment trusts, and closed-end funds. We require the firms to be recorded in CRSP for one year before and one year after the listing date on the NYSE. We obtain data on book equity, closing price and shares outstanding from COMPUSTAT.

Previous studies have shown that inclusion in the S&P 500 index is associated with an increase in the comovement of the included stock returns with the index returns. The S&P 500 index is widely followed by index funds, and common price pressures may well induce positive comovement among the member stocks. Our focus is on firms that switch from the NASDAQ to the NYSE, with little a priori reasons for common price pressures associated with the move.

4.2 Control sample

It is possible that investor groups may congregate around firms of a certain size or industry affiliation, making it difficult to draw clean inferences by the switch. We therefore form a size and industry matched control sample of firms that remain listed on the NYSE. The matching procedure is as follows. We first find all firms with common stock as share code recorded in CRSP that remain traded on NASDAQ. We obtain fiscal year-end data on price, book equity, and industry affiliation for these firms from COMPUSTAT. We delete firms with negative values of book equity or stock price, and calculate the market value of equity as our proxy for size. For each event firm that switches to the NYSE at date ***t***, we retain as control firms that are in the same industry based on two-digit SIC.

We follow Huang and Stoll's (1996) matching procedure, and delete the pair for which $\left|\frac{price^{control} - price^{event}}{(price^{control} + price^{event})/2}\right| \geq 1$. The purpose of this screen is to eliminate potential pairs for which the price levels are too far apart.

For each remaining available firm in the control sample, we calculate the absolute difference in market value with the event firm, and select the control firm with the lowest difference in size. Our matching procedure yielded 384 distinct control firms[5]. If a control firm was chosen multiple times, it was assigned to the event firm with the lowest absolute difference. We delete the other pairs with duplicate control firms that have higher absolute difference in size[6].

4.3 Sample characteristics

Of the 557 firms that switched to the NYSE between 1988 and 2000 (with available price data for one year before and one year after the event), we are able to find a matched control firm for 384 firms. Summary data on the market value of equity, and market to book ratio, total assets and stock price for the event and control samples are presented in **Table 1**. All variables are measured at the end of the fiscal year prior to the date of switching to the NYSE. Turnover and spread are measured over one year preceding the switching date and not the including the month before the event date.

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[5] Huang and Stoll's (1996) procedure of using a matching score to select potential candidate provides a similar control sample.

[6] We are able to obtain a higher percentage with a less restrictive band around the size of sample firms, but the matches are less meaningful.

We find that the average market value of equity is similar for the event and control firms, as per our design. The market-to-book ratios are similar as well, but the assets seem to differ for certain years, with the firms that switch to the NYSE having higher values than the control firms. Overall, the mean market value of equity, total assets, and market to book ratios is somewhat lower for the control firms. These comparisons show that our matching procedure has worked well.

Figure 1 presents the distribution of the event for the full sample of 557 firms, as well as for the matched sample of 384 firms, that switched to the NYSE between 1988 and 2000. We note that the peak activity is in 1995–1998. There were relatively fewer switches in 2000, similar to the first part of the 1990s. December appears to attract the most switches to the NYSE, while the other months show a fairly even distribution. These results are materially similar for both the full sample of 557 firms, and the smaller sample of 384 firms with matched control firms.

5 Empirical findings

5.1 Measuring stock price comovement

Under the habitat hypothesis, stocks that move from NASDAQ to the NYSE will comove more with NYSE stocks and less with NASDAQ stocks after the switch. We estimate the model of price-adjustment shown below using daily stock and index return data from day -300 to day +300 around the event date (defined as the date of switching to the NYSE). The effects of listing effect are captured using an indicator variable for the post listing period interacted with the market return. The indicator variables are defined in such a way that they measure the incremental change in slope on the market return from one year to another. We exclude trading days (-50 , +50) around the switch to exclude short-term return effects.

$$
\begin{aligned}
R_{i,t} = \alpha_{0i} + \alpha_i D_{i,t} + \beta_i^{NYS} R_t^{NYS} + \Delta\beta_i^{NYS} R_t^{NYS} D_{i,t} + \beta_i^{NAS} R_t^{NAS} \\
+ \Delta\beta_i^{NAS} R_t^{NAS} D_{i,t} + \gamma_i^{NYS\ \text{Ind}} R_t^{NYS\ \text{Ind}} + \gamma_i^{NAS\ \text{Ind}} R_t^{NAS\ \text{Ind}} + \varepsilon_{i,t}
\end{aligned}
$$

- $R_{i,t}$ is the return on day t of the stock that moves from NASDAQ to NYSE;
- R_t^{NYS} is the NYSE equal-weighted market return on day t (this excludes the switching stock after the move to the NYSE);
- R_t^{NAS} is the NASDAQ equal-weighted market return on day t (this excludes the switching stock while it trades on NASDAQ, i.e. before the move to the NYSE);
- $R_t^{NYS\ \text{Ind}}$ is the NYSE equal-weighted industry return on day t (this excludes the switching stock after the move to the NYSE);
- $R_t^{NAS\ \text{Ind}}$ is the NASDAQ equal-weighted industry return on day t (this excludes the switching stock while it trades on NASDAQ, i.e. before the move to the NYSE);

- D_1=1 for trading days (+51, 300) after the event, and 0 otherwise

The slope coefficients (β) on NASDAQ and NYSE market returns measure comovement with NASDAQ and NYSE stocks. The coefficients ($\Delta\beta$) on the market returns interacted with the indicator variable measure the change in the comovement with the market after the stocks switch exchanges.

We focus on the results for the period 1988-2000, for which we also have order imbalance data. However, we also examine the results for an earlier period 1973-1987. **Table 2** summarizes the coefficient estimates from the above regression. Panel A reports the results for the full sample period 1973-2000 and for two subperiods, 1973-1987 and 1988-2000. Panel B reports the results for 1988-2000 for the test sample of switchers and a control sample matched on industry, price and market capitalization. Panel C augments the simple bivariate specification with industry returns. The addition of industry returns accounts for differences in the industrial composition of the two markets, and also provides a loose control for cash flow effects. In each panel, we present the mean coefficients and the corresponding p-value. In addition, we present the median coefficients and a p-value from the nonparametric signed rank test of the null hypothesis that the median is zero.

In Panel B (1988-2000, bivariate specification), the mean change in the NYSE beta across the 557 switches is 0.15 while the median change is 0.17. Both are significantly above zero. The mean change in the NASDAQ beta is -0.21, and the median change is -0.20 and both are significantly below zero. Thus, the switching firms see their returns comove more strongly with the return to other NYSE stocks and less strongly with NASDAQ stocks.

We repeat this analysis for a control sample of 384 similar stocks. If the changes for the test sample are part of a broader shift in return comovement, so that firms in a particular industry or of a certain size (not just switching firms) happen to experience greater comovement with NYSE stocks, the change in betas for the control sample will be similar to those for the test sample. Panel B shows, however, that the mean and median shift in NYSE betas for the control sample are indistinguishable from zero. The mean change in the NASDAQ beta is -0.07 and not significantly different from zero. T-tests comparing the shift in betas for the two samples has a p-value of 0.12 (for the NYSE beta) and 0.15 (for the NASDAQ beta), but they suffer from low power, as the beta shift for the test sample is three times as large as that for the control sample.

Panel C adds industry returns as controls to the model. The positive and highly significant industry coefficients reveal that the test and control stock returns comove strongly with their industry cohort from both the NYSE and NASDAQ. However, controlling for industry effects, the coefficients of interest change by very little. The mean change in NYSE (NASDAQ) beta for the test sample is 0.14 (-0.20) and highly significant, while that for the control sample is 0.03 (-0.04) and indistinguishable from zero.

Three other comments are in order about the results. First, as shown in Panel A of Table 2, the changes in comovement we have focused on are also evident in an earlier subperiod. In fact, the changes in beta are even larger during 1973-1987 than during 1988-2000. The mean change in NYSE beta is 0.26, while the mean change in NASDAQ beta is -0.44. The fact that comovement is not a recent phenomenon suggests that stock market innovations introduced over the past decade, such as automated order routing systems, are not responsible for comovement. Rather, it is likely to be something inherent in the trading environment. Second, the pre-switch betas for the test and control samples are strikingly similar, e.g. 0.34 and 0.33 on NYSE returns and 0.46 and 0.45 on NASDAQ returns in Panel C. This suggests that our matching procedure works well. More relevant, the magnitude of the change in betas is smaller that in Barberis, Shleifer and Wurgler (approximately 0.30 in their sample of S&P additions). The larger size of their coefficients is unsurprising given the money dedicated to indexing. However, the fact that our coefficients are half as large points to the fact that exchange switches generate economically significant changes in comovement.

These results are at odds with the fundamentals based explanation for comovement and support the friction or sentiment based comovement. The control sample allows us to isolate the impact of a change in habitat, and not merely a change in the complexion of the migrating securities that may in itself attract new clienteles.

5.2 Trading comovement

The habitat model of comovement proposes that investors pick from and trade securities from familiar albeit restricted baskets and this induces excess comovement in returns for securities that are part of this basket vis-à-vis securities that are not. A natural extension of our returns analysis is to examine comovement in trading. The measure of trading we employ is order imbalance, defined here as the volume of buys less the volume of sells. Further, we separate trades into small (100-400 shares), medium (500-9900 shares), and large (10,000+ shares). Small trades are likely to originate from individual investors, while medium trades are more likely to originate from sophisticated investors (e.g. informed traders or institutions). Using ISSM and TAQ data, we create daily order imbalances for the switching firms and for all stocks on the NYSE, NASDAQ. We then create equally-weighted averages for the NYSE, NASDAQ and the industries and regress order imbalance for the stock on the contemporaneous equally-weighted NYSE, NASDAQ and industry imbalances (again excluding the firm from the computation of these averages).

$$\begin{aligned} OF_{i,t} &= \alpha_{0i} + \alpha_i D_{i,t} + \beta_i^{NYS} OF_t^{NYS} + \Delta\beta_i^{NYS} OF_t^{NYS} D_{i,t} \\ &\quad + \beta_i^{NAS} OF_t^{NAS} + \Delta\beta_i^{NAS} OF_t^{NAS} D_{i,t} + \gamma_i^{NYS\,\mathrm{Ind}} OF_t^{NYS\,\mathrm{Ind}} + \gamma_i^{NAS\,\mathrm{Ind}} OF_t^{NAS\,\mathrm{Ind}} + \varepsilon_{i,t} \end{aligned}$$

where $OF_{i,t}$ is the daily order flow for stock *i*, OF_t^{NYS}, OF_t^{NAS}, $OF_t^{NYS\ Ind}$ and $OF_t^{NAS\ Ind}$ are NYSE and NASDAQ daily equally-weighted market and industry order flow indices (excluding $OF_{i,t}$).

Table 3 has the results. As in Table 2, Panel A contains the results of the bivariate order imbalance regression where NYSE and NASDAQ imbalances are included, while Panel B contains the results for the augmented specification that also includes the industry imbalances. In each panel, we report the results for all trades, and for the trade size partitions.

Table 3 shows strong comovement in trading paralleling those in returns. As seen in the significantly positive and significant mean betas on NYSE and NASDAQ order imbalances, order imbalance for the switching stocks comoves strongly with both NYSE and NASDAQ order imbalances before the move to the NYSE. Moreover, the beta on the NASDAQ imbalance is larger than that on the NYSE imbalance. The coefficient capturing the change in the NYSE beta is significantly above zero; that capturing the change in NASDAQ beta is significantly below zero. Thus, after the move to the NYSE, comovement with NYSE trading increases while that with NASDAQ trading decreases. This result holds for all trades and for trades in every trade size category. The effects are strongest for medium trades, suggesting that sophisticated investors such as institutions display a stronger tendency to trade stocks on the same exchange relative to smaller investors.

When we estimate the same model for the control sample, the coefficients that represent the change in beta are never significant, and these are always significantly smaller than those for the test sample (based on t-tests on the two sample means). The coefficients for the control sample are also economically smaller than those for the test sample, often only one-tenth to one-twentieth as large. The contrast between the change in betas for the test and control samples in the order imbalance regressions is much sharper in relation to the return regressions. A possible reason for this is that order imbalances are less noisy than returns (which are affected by other factors).

Our analysis of trading for the firms that move from NASDAQ to the NYSE confirms that order imbalance displays strong comovement with local order imbalance. This is consistent with the predictions of the habitat based model of comovement. In Section 5.4, we revisit the relation between trading and returns.

5.3 Cash flow comovement

In Table 4 we test whether the increase in comovement with NYSE stocks is related to fundamentals. We use operating cash flows as our proxy for fundamentals – this ought to be uncorrelated to investor sentiment. It is possible that the results in table 2 are driven by a shift in the comovement of the fundamentals of the switching company—after the listing on the NYSE, the firm's cash flows display stronger comovement with aggregate NYSE firms' cash flows. We employ the following model to test for fundamental comovement.

If a shift in fundamental comovement is responsible for the increased comovement of the switching stock's returns with NYSE returns, we should see a significant coefficient on the NYSE dummy variable.

$$CF_{i,t} = \alpha_{0i} + \alpha_i D_{i,t} + \beta_i^{NYS} CF_t^{NYS} + \Delta\beta_i^{NYS} CF_t^{NYS} D_{i,t} + \beta_i^{NAS} CF_t^{NAS} + \Delta\beta_i^{NAS} CF_t^{NAS} D_{i,t} + \varepsilon_{i,t}$$

where $CF_{i,t}$ is the quarterly cash flow on stock *i*, CF_t^{NYSE} and CFR_t^{NASDAQ} are the NYSE and NASDAQ quarterly equally-weighted market index. $D_{i,t}$ is an indicator variable equal to 1 over the quarters after the switching date. The regression also includes an indicator variable equal to 1 for the forth quarter.

The results in table 4 do not support the story that cash flow comovement increases after the switch. In panel A, we run firm fixed effect panel regressions, and find that the coefficient estimate for the interaction effect on an equally-weighted cash flow index for all NYSE-listed firms is not significant. We repeat the test for control sample firms, and do not find any significant coefficients. We also estimate the regression separately for each firm, and then pool the coefficients. These results are presented in panel B, and remain insignificant.

5.4 Residual return comovement

The previous sections have documented that a switching firm sees its returns comove more with NYSE market returns and less with NASDAQ returns. Additionally, its order imbalances comove more with NYSE order imbalances and less with NASDAQ imbalances. Finally, comovement of the switching firm's cash flows (fundamentals) with aggregate NYSE and NASDAQ cash flows does not appear to change around the switch. This evidence supports the habitat hypothesis: investors appear to regard NYSE and NASDAQ stocks as distinct and to trade NYSE and NASDAQ stocks as separate baskets.

This section carries out one further test of the habitat hypothesis. If comovement in trading drives return comovement, return comovement should decline once the comovement in trading is accounted for. This is seen in the following simplified statistical model similar to that introduced by Hasbrouck (1991):

$$R_{i,t} = \alpha_i + \lambda_i OIB_{i,t} + \varepsilon_{i,t}\,,\; R_{j,t} = \alpha_j + \lambda_j OIB_{j,t} + \varepsilon_{j,t}$$

$$\Rightarrow \mathrm{cov}(R_{i,t}, R_{j,t}) = \lambda_i \lambda_j \,\mathrm{cov}(OIB_{i,t} OIB_{j,t}) + \mathrm{cov}(\varepsilon_{i,t}, \varepsilon_{j,t})$$

Since λ_i and λ_j are likely to be positive, $\mathrm{cov}(\varepsilon_{i,t}, \varepsilon_{j,t}) < \mathrm{cov}(R_{i,t}, R_{j,t})$ as long as $\mathrm{cov}(OIB_{i,t} OIB_{j,t}) > 0$.

In order to test this conjecture, our analysis is carried out in three steps. First, we regress daily returns for the switching firm on its daily order imbalance for the year before and the year after the switch. We save the residual returns from this regression; these represent the returns to the switching firm after controlling for trading in the stock. Next, we run similar regressions of daily returns on daily order imbalance for each stock on the NYSE and NASDAQ in each calendar year and save the residual returns.[7] Using these daily residual returns, we then construct equally-weighted residual return indexes for the NYSE, NASDAQ and the industries for each date. In the third step, we regress residual stock returns on the residual return indexes. If correlated trading explains the comovement in returns, the shift in beta should be less pronounced than in Table 2. We carry out similar tests for the control sample.

The results are shown in Table 5. There are several findings of interest. Most importantly, the beta shift declines in relation to Table 2. In the bivariate model, the change in beta on the NYSE market declines to 0.07 (from 0.15 in Table 2) and is no longer significant at conventional levels (p-value of 0.10). The mean change in the NASDAQ slope coefficient continues to be significant, but it too declines from -0.21 in table 2 to -0.14. Identical patterns hold for the model where we add the industry returns.

The coefficients for the control sample also drop somewhat in relation to Table 2. However, the difference between the test and control samples is no longer significant in either the bivariate or the expanded models, and the p-value for the test comparing the change in NYSE and NASDAQ betas for the test and control samples rises in relation to Table 2.

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[7] This test assumes that order imbalance is exogenous of returns at the daily horizon. See Chordia and Subrahmanyam (XX) for similar tests to study a different issue.

In sum, Section 5.2 shows that trading for stocks that move from NASDAQ to the NYSE displays greater comovement with NYSE trading and less with NASDAQ trading. This section shows that correlated trading within markets can explain the return comovement documented in Section 5.1. Some of the return comovement remains, but a large portion is explained by comovement in trading. This link between comovement in trading and in returns provides strong support for the habitat model.

6 Concluding comments

We have documented that once a stock changes its trading location, its returns start to move more with returns to other stocks in the new market and less with returns in the old market. Our tests focus on a sample comprising 557 stocks that switch from NASDAQ to the NYSE over 1988–2000. Looking at return comovement for two years centered on the switch, we find that the change in beta on the NYSE market return is positive and significant, and the change in beta with the NASDAQ market return is negative and significant.

Changes in fundamentals (cash flow) comovement do not appear responsible for the changed patterns of return comovement. Trading for the switching firms, too, comoves more strongly with NYSE trading and less with NASDAQ trading, and this comovement in trading appears to explain much of the change in return comovement. These patterns are absent in a control sample matched on size and industry. Our findings are at odds with fundamentals-driven comovement and provide further support for the habitat view of comovement.

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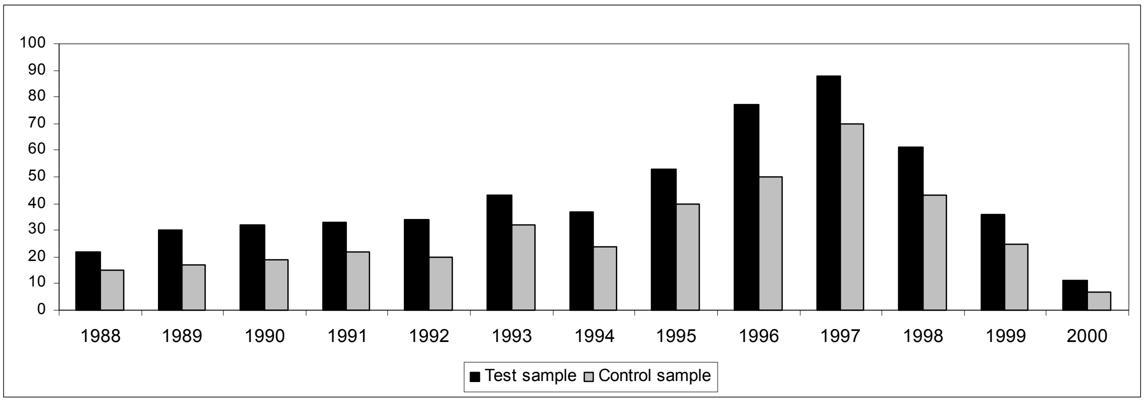
Figure 1: Event distribution

This table shows the number of firms that changed location from NASDAQ to NYSE between 1988 – 2000 by year and by month. We present the number of firms for the entire sample (557 firms) and for the sample of firms for which an industry and size matched control firm was found (384 firms). To enter the sample, a stock must have price data for one year before and one year after the switching date.



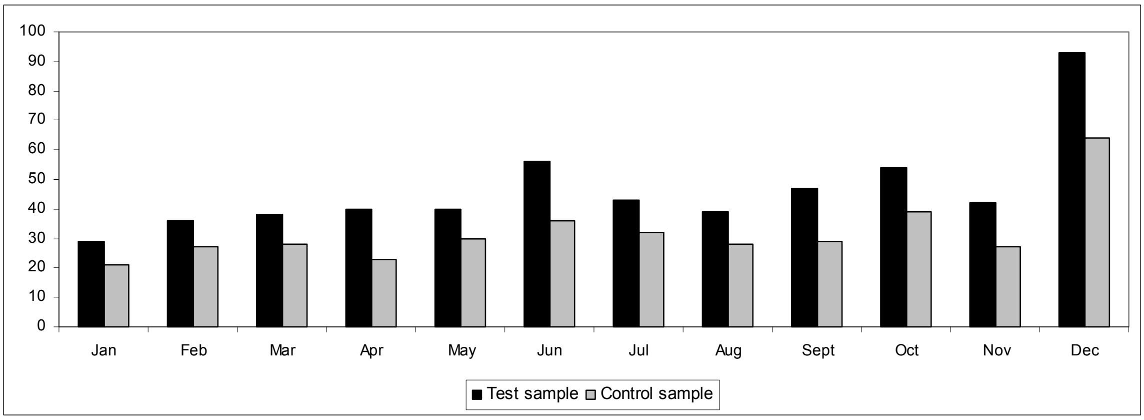


Table 1: Descriptive statistics for the test and the control firms

The table presents summary characteristics for the test sample and the control sample. The test sample is formed of NASDAQ firms that move to NYSE between 1988 and 2000. The control sample is formed of NASDAQ firms that do not change the trading location. Assets, market to book ratio, market value of equity and stock price are measured at the end of the most recent fiscal year prior to the switching date. Turnover and spread are measured as means (medians) over one year preceding the switching date and not the including the month before the event date.

	Test sample		**Control sample**	
	Mean	**Median**	**Mean**	**Median**
Market Capitalization	754	343	565	247
Total Assets	1777	324	1033	193
Market-to-book	3.12	2.46	3.39	2.36
Price	25.53	22.25	22.25	19.59
Turnover	0.007	0.005	0.007	0.004
Spread	0.474	0.416	0.490	0.428

Event	**Market Capitalization**		**Total Assets**		**Market-to-book**		**Price**		**Turnover**		**Spread**	
year	**Test**	**Control**	**Test**	**Control**	**Test**	**Control**	**Test**	**Control**	**Test**	**Control**	**Test**	**Control**
1988	502	215	4359	1277	2.24	3.43	18.76	18.66	0.006	0.004	0.32	0.51
1989	449	277	2561	1165	2.54	2.53	18.20	20.80	0.008	0.004	0.27	0.55
1990	373	263	1382	850	2.65	4.85	21.02	17.55	0.007	0.006	0.33	0.32
1991	451	280	1487	1053	2.45	1.97	21.89	23.29	0.007	0.006	0.45	0.63
1992	454	346	1064	278	3.52	3.05	26.42	23.22	0.009	0.007	0.67	0.49
1993	440	402	2143	1503	2.58	2.49	24.38	22.14	0.005	0.006	0.55	0.65
1994	408	308	704	357	2.79	3.88	23.70	21.33	0.007	0.008	0.58	0.58
1995	484	301	1081	915	3.01	3.90	21.58	18.05	0.004	0.004	0.50	0.48
1996	647	474	1106	834	3.17	3.04	26.04	26.05	0.008	0.007	0.52	0.62
1997	756	547	839	682	3.34	3.47	28.91	23.39	0.007	0.008	0.60	0.49
1998	1106	648	2895	684	4.04	4.11	28.92	22.18	0.009	0.009	0.33	0.31
1999	1770	1052	4370	2795	3.37	3.11	34.94	22.91	0.007	0.006	0.33	0.27
2000	4467	6394	1809	4674	4.28	4.31	31.63	29.41	0.006	0.007	0.41	0.27

Table 2: Returns comovement

The table presents estimates of the following model:

$$R_{i,t} = \alpha_{0i} + \alpha_i D_{i,t} + \beta_i^{NYS} R_{i,t}^{NYS} + \Delta\beta_i^{NYS} R_{i,t}^{NYS} D_{i,t} + \beta_i^{NAS} R_{i,t}^{NAS} + \Delta\beta_i^{NAS} R_{i,t}^{NAS} D_{i,t} + \gamma_i^{NYS\ Ind} R_{i,t}^{NYS\ Ind} + \gamma_i^{NAS\ Ind} R_{i,t}^{NAS\ Ind} + \varepsilon_{i,t}$$

$R_{i,t}$ is the daily return on stock *i*, $R_{i,t}^{NYS}$, $R_{i,t}^{NAS}$, $R_{i,t}^{NYS\ Ind}$ and $R_{i,t}^{NAS\ Ind}$ are NYSE and NASDAQ daily equally - weighted market and industry return indices (excluding $R_{i,t}$). $D_{i,t}$ is an indicator variables equal to 1 for the trading days after the switching date and 0 before. For each stock i, the specification is estimated over (-300, +300) trading days around the event, and not including (-50, +50) around the listing date, to avoid any return effect of the actual event. Panel A and B do not include the industry return indices. The values reported are means and medians along with their p-values. Panel A presents the estimates from the above specification for the test sample for three time intervals. The estimation in Panel A is based on daily close-close returns obtained from CRSP database. Panels B and C presents the estimates from the above specification for the test sample and the control sample. The estimations are based on daily close-close returns from TAQ and ISSM midquotes. The p-values for a two-side test on the difference in means (medians) are provided.

The test sample includes stocks that move from NASDAQ to NYSE between 1973 and 2000 (Panel A); and 1988 - 2000 (Panel B and C). The control firms are the non-event firms on NASDAQ matched on size and industry. The samples are restricted to stocks that have available price data for the estimation window of (-300, +300) trading days around the event. The matching procedure is as follows. We first find all firms with common stock as share code recorded in CRSP that remain traded on NASDAQ. We obtain fiscal year-end data on price, book equity, and industry affiliation for these firms from COMPUSTAT. We delete firms with negative values of book equity or stock price, and calculate the market value of equity as our proxy for size. For each event firm that switches to the NYSE at date t, we retain as control firms that are in the same industry based on two-digit SIC. We eliminate potential pairs for which the price levels are too far apart. For each remaining available firm in the control sample, we calculate the absolute difference in market value with the event firm, and select the control firm with the lowest difference in size.

		Intercept	α_1	β^{NYS}	$\Delta\beta^{NYS}$	β^{NAS}	$\Delta\beta^{NAS}$	$\gamma^{NYS\ Ind}$	$\gamma^{NAS\ Ind}$
Panel A: Test sample over extended sample period (1973 - 2000)									
1973 - 1987	Mean	0.00	0.00	0.70	0.26	0.68	-0.44		
(328 firms)		*(0.00)*	*(0.01)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
	Median	0.00	0.00	0.59	0.17	0.67	-0.40		
		(0.00)	*(0.08)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
1988 - 2000	Mean	0.00	0.00	0.68	0.15	0.53	-0.20		
(616 firms)		*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
	Median	0.00	0.00	0.62	0.19	0.42	-0.23		
		(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
1973 - 2000	Mean	0.00	0.00	0.69	0.18	0.58	-0.29		
(944 firms)		*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
	Median	0.00	0.00	0.61	0.19	0.53	-0.30		
		(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		

Table 2 (continued)

		Intercept	α_1	β^{NYS}	$\Delta\beta^{NYS}$	β^{NAS}	$\Delta\beta^{NAS}$	$\gamma^{NYS\ Ind}$	$\gamma^{NAS\ Ind}$
Panel B: Test vs control sample									
Test sample (557 firms)	Mean	0.00	0.00	0.61	0.15	0.61	-0.21		
		(0.02)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
	Median	*0.00*	*0.00*	*0.51*	*0.17*	*0.44*	*-0.20*		
		(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
Control sample (384 firms)	Mean	0.00	0.00	0.51	0.05	0.76	-0.07		
		(0.00)	(0.55)	(0.00)	(0.30)	(0.00)	(0.37)		
	Median	*0.00*	*0.00*	*0.42*	*0.05*	*0.60*	*-0.13*		
		(0.00)	(0.18)	(0.00)	(0.12)	(0.00)	(0.01)		
Test of means (p-values)		0.00	0.06	0.05	0.12	0.01	0.15		
Test of medians (p-values)		0.00	0.00	0.30	0.04	0.02	0.41		
Panel C: Test vs control sample									
Test sample (557 firms)	*Mean*	*0.00*	*0.00*	*0.34*	*0.14*	*0.46*	*-0.20*	*0.26*	*0.15*
		(0.01)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
	Median	*0.00*	*0.00*	*0.26*	*0.16*	*0.32*	*-0.17*	*0.19*	*0.08*
		(0.01)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Control sample (384 firms)	*Mean*	*0.00*	*0.00*	*0.33*	*0.03*	*0.45*	*-0.04*	*0.21*	*0.25*
		(0.00)	*(0.47)*	*(0.00)*	*(0.58)*	*(0.00)*	*(0.60)*	*(0.00)*	*(0.00)*
	Median	*0.00*	*0.00*	*0.23*	*0.02*	*0.36*	*-0.13*	*0.10*	*0.13*
		(0.00)	*(0.25)*	*(0.00)*	*(0.23)*	*(0.00)*	*(0.02)*	*(0.00)*	*(0.00)*
Test of means (p-values)		0.00	0.10	0.87	0.07	0.88	0.09	0.38	0.00
Test of medians (p-values)		0.00	0.01	0.52	0.04	0.58	0.41	0.01	0.01

Table 3: Order flow comovement

The table presents estimates of the following model:

$$OF_{i,t} = \alpha_{0i} + \alpha_i D_{i,t} + \beta_i^{NYS} OF_{i,t}^{NYS} + \Delta\beta_i^{NYS} OF_{i,t}^{NYS} D_{i,t}$$
$$+ \beta_i^{NAS} OF_{i,t}^{NAS} + \Delta\beta_i^{NAS} OF_{i,t}^{NAS} D_{i,t} + \gamma_i^{NYS\ Ind} OF_{i,t}^{NYS\ Ind} + \gamma_i^{NAS\ Ind} OF_{i,t}^{NAS\ Ind} + \varepsilon_{i,t}$$

$OF_{i,t}$ is the daily order flow for stock *i*, $OF_{i,t}^{NYS}$, $OF_{i,t}^{NAS}$, $OF_{i,t}^{NYS\ Ind}$ and $OF_{i,t}^{NAS\ Ind}$ are NYSE and NASDAQ daily equally - weighted market and industry order flow indices (excluding $OF_{i,t}$). $D_{i,t}$ is an dummy equal to 1 for the trading days after the switching date and 0 before. Order flow (net volume or net number of shares) is calculated by classifying transactions as buys and sells (using the Lee-Ready (1991) algorithm) and calculating (buy volume – sell volume) / (buy volume + sell volume). For each stock *i* (test and control), the specification is estimated over (-300, +300) trading days around the event, and not including (-50, +50) around the listing date. The model is estimated separately for all size trades, trades between 100 – 400, 500 – 9900, and larger than 10,000. Panel A does not include the industry indices. The values reported are means and medians along with their p-values. The p-values for a two-side test on the difference in means are provided.

The test sample includes stocks that move from NASDAQ to NYSE between 1988 – 2000. The control firms are the non-event firms on NASDAQ matched on size and industry. The samples are restricted to stocks that have available price data for the estimation window of (-300, +300) trading days around the event. The matching procedure is as follows. We first find all firms with common stock as share code recorded in CRSP that remain traded on NASDAQ. We obtain fiscal year-end data on price, book equity, and industry affiliation for these firms from COMPUSTAT. We delete firms with negative values of book equity or stock price, and calculate the market value of equity as our proxy for size. For each event firm that switches to the NYSE at date t, we retain as control firms that are in the same industry based on two-digit SIC. We eliminate potential pairs for which the price levels are too far apart. For each remaining available firm in the control sample, we calculate the absolute difference in market value with the event firm, and select the control firm with the lowest difference in size.

Trade size	Intercept	α_1	β^{NYS}	$\Delta\beta^{NYS}$	β^{NAS}	$\Delta\beta^{NAS}$	$\gamma^{NYS\ Ind}$	$\gamma^{NAS\ Ind}$
Panel A								
Test sample								
All trades (557 firms)	0.03	0.00	0.26	0.58	0.67	-0.47		
	(0.00)	*(0.76)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
100 – 400 (555 firms)	0.03	0.04	0.28	0.36	0.60	-0.32		
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
500 – 9900 (553 firms)	0.03	-0.01	0.30	0.58	0.75	-0.58		
	(0.00)	*(0.54)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*		
> 10000 (276 firms)	0.04	-0.02	-0.06	0.73	0.66	-0.58		
	(0.00)	*(0.33)*	*(0.25)*	*(0.00)*	*(0.00)*	*(0.00)*		
Control sample								
All trades (384 firms)	0.02	-0.02	0.20	0.02	0.76	-0.10		
	(0.04)	*(0.15)*	*(0.00)*	*(0.75)*	*(0.00)*	*(0.20)*		
100 – 400 (375 firms)	0.01	-0.02	0.20	0.03	0.73	-0.10		
	(0.38)	*(0.19)*	*(0.00)*	*(0.70)*	*(0.00)*	*(0.21)*		
500 – 9900 (376 firms)	0.01	0.00	0.24	-0.01	0.78	-0.03		
	(0.15)	*(0.74)*	*(0.00)*	*(0.89)*	*(0.00)*	*(0.68)*		
> 10000 (179 firms)	0.03	-0.01	-0.03	0.05	0.84	0.02		
	(0.07)	*(0.51)*	*(0.68)*	*(0.59)*	*(0.00)*	*(0.89)*		
Test of means (p-values)								
All trades	0.21	0.18	0.26	0.00	0.19	0.00		
100 - 400	0.04	0.00	0.21	0.00	0.08	0.02		
500 – 9900	0.14	0.91	0.29	0.00	0.62	0.00		
> 10000	0.63	0.90	0.77	0.00	0.27	0.01		

Table 3 (continued)

Trade size	Intercept	α_1	β^{NYS}	$\Delta\beta^{NYS}$	β^{NAS}	$\Delta\beta^{NAS}$	$\gamma^{NYS\ \text{Ind}}$	$\gamma^{NAS\ \text{Ind}}$
Panel B								
Test sample								
All trades (557 firms)	0.03	0.00	0.12	0.59	0.50	-0.48	0.13	0.17
	(0.00)	*(0.69)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
100 – 400 (555 firms)	0.03	0.04	0.15	0.37	0.47	-0.34	0.13	0.15
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
500 – 9900 (553 firms)	0.03	0.00	0.15	0.58	0.57	-0.58	0.15	0.18
	(0.00)	*(0.67)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
> 10000 (276 firms)	0.04	-0.02	-0.06	0.74	0.58	-0.55	0.00	0.06
	(0.00)	*(0.35)*	*(0.28)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.92)*	*(0.13)*
Control sample								
All trades (384 firms)	0.02	-0.02	0.11	0.03	0.59	-0.10	0.08	0.18
	(0.02)	*(0.09)*	*(0.04)*	*(0.63)*	*(0.00)*	*(0.17)*	*(0.01)*	*(0.00)*
100 – 400 (375 firms)	0.01	-0.02	0.08	0.05	0.58	-0.12	0.10	0.16
	(0.48)	*(0.11)*	*(0.19)*	*(0.47)*	*(0.00)*	*(0.13)*	*(0.01)*	*(0.00)*
500 – 9900 (376 firms)	0.01	-0.01	0.16	-0.01	0.53	-0.04	0.07	0.27
	(0.08)	*(0.56)*	*(0.01)*	*(0.93)*	*(0.00)*	*(0.60)*	*(0.04)*	*(0.00)*
> 10000 (179 firms)	0.03	-0.01	-0.01	0.05	0.79	0.00	-0.02	0.05
	(0.09)	*(0.50)*	*(0.93)*	*(0.60)*	*(0.00)*	*(0.98)*	*(0.46)*	*(0.28)*
Test of means (p-values)								
All trades	0.37	0.11	0.88	0.00	0.34	0.00	0.19	0.82
100 – 400	0.05	0.00	0.45	0.00	0.23	0.02	0.59	0.77
500 – 9900	0.27	0.85	0.85	0.00	0.64	0.00	0.07	0.09
> 10000	0.64	0.92	0.60	0.00	0.22	0.02	0.55	0.84

Table 4: Cash flow comovement
The table presents estimates of the following model:

$$CF_{i,t} = \alpha_{0i} + \alpha_i D_{i,t} + \beta_i^{NYS} CF_{i,t}^{NYS} + \Delta\beta_i^{NYS} CF_{i,t}^{NYS} D_{i,t} + \beta_i^{NAS} CF_{i,t}^{NAS} + \Delta\beta_i^{NAS} CF_{i,t}^{NAS} D_{i,t} + \varepsilon_{i,t}$$

$CF_{i,t}$ is the quarterly cash flow for stock *i*, $CF_{i,t}^{NYS}$ and $CF_{i,t}^{NAS}$ are NYSE and NASDAQ quarterly equally - weighted cash flow indices (excluding $CF_{i,t}$). $D_{i,t}$ is a dummy equal to 1 for the quarters following the switching date and 0 before. The regression also includes an indicator variable equal to 1 for the forth quarter (estimates not reported). Cash flow is defined as (net income + depreciation) / total assets and the accounting data are provided by COMPUSTAT. The specification is estimated over (-2, +3) years around the event using a panel regression method (Panel A) and separately for each stock (Panel B). The values reported in Panel B are means along with their p-values (outliers or values smaller than -8 or greater than 8 are deleted). The p-values for a two-side test on the difference in means are provided.

The test sample includes stocks that move from NASDAQ to NYSE between 1988 - 2000. The control firms are the non-event firms on NASDAQ matched on size and industry. The samples are restricted to stocks that have available price data for the estimation window of (-300, +300) trading days around the event. The matching procedure is as follows. We first find all firms with common stock as share code recorded in CRSP that remain traded on NASDAQ. We obtain fiscal year-end data on price, book equity, and industry affiliation for these firms from COMPUSTAT. We delete firms with negative values of book equity or stock price, and calculate the market value of equity as our proxy for size. For each event firm that switches to the NYSE at date t, we retain as control firms that are in the same industry based on two-digit SIC. We eliminate potential pairs for which the price levels are too far apart. For each remaining available firm in the control sample, we calculate the absolute difference in market value with the event firm, and select the control firm with the lowest difference in size.

	Intercept	α_1	β^{NYS}	$\Delta\beta^{NYS}$	β^{NAS}	$\Delta\beta^{NAS}$
Panel A: Panel regression						
Test sample	0.063	-0.007	0.005	0.003	-0.003	0.032
	(0.00)	*(0.00)*	*(0.93)*	*(0.97)*	*(0.96)*	*(0.64)*
Control sample	0.012	-0.005	0.014	0.015	-0.126	0.202
	(0.28)	*(0.19)*	*(0.90)*	*(0.92)*	*(0.27)*	*(0.12)*
Panel B: Firm by firm regression, pool coefficients						
Test sample (308)	0.03	-0.01	0.16	0.05	0.03	-0.16
	(0.00)	*(0.23)*	*(0.32)*	*(0.87)*	*(0.69)*	*(0.11)*
Control sample (195)	0.03	-0.01	0.11	0.08	-0.08	0.20
	(0.00)	*(0.45)*	*(0.61)*	*(0.83)*	*(0.56)*	*(0.22)*
Test of means (p-values)	0.89	0.89	0.85	0.94	0.48	0.06

Table 5: Residuals comovement

The table presents estimates of the following model:

$$RES_{i,t} = \alpha_{0i} + \alpha_i D_{i,t} + \beta_i^{NYS} RES_{i,t}^{NYS} + \Delta\beta_i^{NYS} RES_{i,t}^{NYS} D_{i,t} + \beta_i^{NAS} RES_{i,t}^{NAS} + \Delta\beta_i^{NAS} RES_{i,t}^{NAS} D_{i,t} + \gamma_i^{NYS\ Ind} RES_{i,t}^{NYS\ Ind} + \gamma_i^{NAS\ Ind} RES_{i,t}^{NAS\ Ind} + \varepsilon_{i,t}$$

$RES_{i,t}$ is the daily residual on stock *i*, $RES_{i,t}^{NAS}$, $RES_{i,t}^{NYS\ Ind}$ and $RES_{i,t}^{NAS\ Ind}$ are NYSE and NASDAQ daily equally - weighted market and industry residual indices (excluding $RES_{i,t}$). $D_{i,t}$ is an indicator variables equal to 1 for the trading days after the switching date and 0 before. The residuals for each stock are obtained from a regression of daily order flow on daily return per year. For each stock i, the above specification is estimated over (-300, +300) trading days around the event, and not including (-50, +50) around the listing date. Panel A does not include the industry index. The values reported are means and medians along with their p-values respectively. The p-values for a two-side test on the difference in means (medians) are provided.

The test sample includes stocks that move from NASDAQ to NYSE between 1988 - 2000. The control firms are the non-event firms on NASDAQ matched on size and industry. The samples are restricted to stocks that have available price data for the estimation window of (-300, +300) trading days around the event. The matching procedure is as follows. We first find all firms with common stock as share code recorded in CRSP that remain traded on NASDAQ. We obtain fiscal year-end data on price, book equity, and industry affiliation for these firms from COMPUSTAT. We delete firms with negative values of book equity or stock price, and calculate the market value of equity as our proxy for size. For each event firm that switches to the NYSE at date t, we retain as control firms that are in the same industry based on two-digit SIC. We eliminate potential pairs for which the price levels are too far apart. For each remaining available firm in the control sample, we calculate the absolute difference in market value with the event firm, and select the control firm with the lowest difference in size.

		Intercept	α_1	β^{NYS}	$\Delta\beta^{NYS}$	β^{NAS}	$\Delta\beta^{NAS}$	$\gamma^{NYS\ Ind}$	$\gamma^{NAS\ Ind}$
Panel A									
Test sample (557 firms)	Mean	0.00	0.00	0.67	0.07	0.47	-0.14		
		(0.67)	*(0.36)*	*(0.00)*	*(0.10)*	*(0.00)*	*(0.00)*		
	Median	0.00	0.00	0.59	0.10	0.33	-0.11		
		(0.62)	*(0.15)*	*(0.00)*	*(0.03)*	*(0.00)*	*(0.00)*		
Control sample (384 firms)	Mean	0.00	0.00	0.56	0.02	0.63	-0.02		
		(0.28)	*(0.36)*	*(0.00)*	*(0.75)*	*(0.00)*	*(0.78)*		
	Median	0.00	0.00	0.46	0.04	0.49	-0.06		
		(0.47)	*(0.50)*	*(0.00)*	*(0.28)*	*(0.00)*	*(0.04)*		
Test of means		0.59	0.68	0.07	0.46	0.00	0.19		
Test of medians		0.28	0.37	0.05	0.44	0.00	0.41		
Panel B									
Test sample (557 firms)	*Mean*	0.00	0.00	0.43	0.08	0.37	-0.15	0.22	0.12
		(0.51)	*(0.22)*	*(0.00)*	*(0.07)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
	Median	0.00	0.00	0.35	0.08	0.26	-0.12	0.18	0.05
		(0.91)	*(0.07)*	*(0.00)*	*(0.03)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Control sample (384 firms)	*Mean*	0.00	0.00	0.41	0.00	0.40	0.00	0.16	0.21
		(0.22)	*(0.30)*	*(0.00)*	*(0.97)*	*(0.00)*	*(0.96)*	*(0.00)*	*(0.00)*
	Median	0.00	0.00	0.32	0.02	0.31	-0.06	0.07	0.09
		(0.36)	*(0.32)*	*(0.00)*	*(0.44)*	*(0.00)*	*(0.07)*	*(0.00)*	*(0.00)*
Test of means		0.61	0.65	0.81	0.25	0.60	0.12	0.28	0.00
Test of medians		0.67	0.71	0.61	0.15	0.14	0.28	0.00	0.03