Example Journal, XXXX, XX: 1–49

How the Stock Ticker Decreased Price Efficiency in the Early 20^{th} Century

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ABSTRACT

We study the stock ticker; a physical device that historically disseminated stock price information. We find that an increased number of ticker subscriptions in a state strengthened the return continuation and return co-movement of firms headquartered in the state. This finding indicates that the increased dissemination of price information decreased price efficiency by increasing uninformed trend chasing and challenges the assumption that greater access to information improves price efficiency.

Keywords: Price Dissemination, Trend Chasing, Return Co-Movement
JEL Codes: G14; N2

We thank Ivo Welch and an anonymous referee as well as Hank Bessembinder, Tom Chang, Tarun Chordia, Zhi Da, Thierry Foucault, Rawley Heimer, Joel Peress, David Solomon, and Filip Zikes.

ISSN XXXX-XXXX; DOI XXXXXXXX

How information affects prices is a fundamental question in asset pricing. To address this question, Tetlock (2014) recommends studying mechanisms that disseminate information to investors. The information-disseminating mechanism we examine is the stock ticker from 1927 until 1981. Historically, this physical device was responsible for disseminating price changes to brokerage offices with a ticker subscription. Therefore, ticker subscriptions enable us to test Hong and Stein (1999)'s prediction that trend-chasing "momentum traders" initiate uninformed buy trades following price increases. Specifically, we test whether increasing the access of investors to price changes decreases price efficiency by increasing uninformed trend chasing.

During our sample period, brokerage offices with a New York Stock Exchange (NYSE) ticker subscription received the most recent transaction price, and the change in this price relative to the opening price, for every NYSE-listed firm. As illustrated in Figure 1, investors congregated in brokerage offices with a ticker subscription to access this public information. The NYSE Yearbook records the annual number of NYSE ticker subscribers in each state from 1927 to 1981. This annual state-level data enables us to examine the impact of disseminating price changes on the price efficiency of firms headquartered in each state.

While the stock ticker is no longer a stand-alone device, the price changes disseminated by the stock ticker became embedded into online trading platforms and the financial media. For example, the Consumer News and Business Channel (CNBC) has stock price data scrolling along the bottom of its broadcast. Therefore, the implications of our study are relevant in the modern era.[1] Moreover, ticker subscriptions enable our empirical tests to isolate the response of investors to price changes. This response cannot be isolated in the modern era where a myriad of information is disseminated to investors. For emphasis, information regarding fundamentals was not disseminated by the stock ticker or any parallel technology during our sample period.

We find that an increase in ticker subscriptions in a state strengthens the return continuation of firms headquartered in the state. Variance ratios also indicate that an increase in ticker subscriptions in a

[1] Although Humphrey Neill's "Tape Reading and Market Tactics: The Three Steps to Successful Stock Trading" and Richard Wyckoff's "Studies in Tape Reading" were originally published in 1931 and 1910, respectively, reprints in 2010 and 2009 attest to the continued interest of investors in the stock ticker.

state results in larger deviations from a random walk for firms headquartered in the state. This evidence is robust to controlling for trading volumes, which increased with ticker subscriptions, and bid-ask spreads. Short-term “price momentum" strategies that condition on ticker subscriptions and the magnitude of prior daily returns also produce a positive return spread that persists beyond a week.

In contrast to the impact of ticker subscriptions on return continuation, we find that returns, trading volumes, bid-ask spreads, number of NYSE-listings, population growth, and economic growth all exert an insignificant impact on ticker subscriptions. The independence of ticker subscriptions from financial, economic, and demographic conditions is an improvement over existing proxies of investor sentiment.[2] Having ticker subscriptions at the state level also improves our identification compared to investor sentiment proxies constructed at the national level.

To measure the intensity of price dissemination, we normalize the number of ticker subscriptions in a state by the number of brokerage offices in the state. This normalization assumes the number of brokerage offices in a state proxies for the number of investors in the state. The positive state-level relation between the intensity of price dissemination and return continuation indicates that return continuation strengthened due to increased price dissemination and not because of an increase in the number of investors. An analysis of large increases in price dissemination and large price changes (returns) provides further empirical support for our trend chasing hypothesis.

We also provide suggestive evidence that the stronger return continuation associated with increased price dissemination results from trend chasing by retail investors. This secondary set of empirical results determines the stock ticker's impact on return co-movement because Pirinsky and Wang (2006) conclude that uninformed trading by local investors increases return co-movement among local stocks. Consistent with their conclusion, we find that an increase in ticker subscriptions in a state increases the return co-movement of local firms. This increase in return co-movement suggests that uninformed trend chasing,

[2] Baker and Wurgler (2006) construct an investor sentiment index from the closed-end fund discount, share turnover, number of IPOs and their average first-day returns, equity share of new issues, and dividend premium.

not greater liquidity, is responsible for the decrease in price efficiency associated with ticker subscriptions.[3] Additional empirical tests confirm that bid-ask spreads and price impacts do not decrease with ticker subscriptions, while Jarrell (1984) reports that trading commissions for NYSE-listed stocks were fixed during our sample period. Thus, changes in either liquidity or transaction costs offer unlikely explanations for the positive relation between ticker subscriptions and return continuation.

To address the possibility that ticker subscriptions are endogenous, we examine the cost of operating a stock ticker. The cost of transmitting data from the NYSE to a stock ticker's location was borne by the ticker subscriber. This cost was regulated by the Federal Communications Commission (FCC) according to the Communications Act of 1934 that established a national policy for setting telecommunication rates. Both rate increases and rate decreases for individual states occurred during our sample period.

We find an inverse relation between the number of ticker subscriptions in a state and data transmission costs from New York City to the state.[4] Thus, higher operating costs for a stock ticker lower the number of ticker subscriptions. We then confirm that lower data transmission costs to a state strengthened the return continuation and return co-movement of firms in the state. An instrumental variable estimation that instruments ticker subscriptions using data transmission costs supports our hypothesis that increased price dissemination by the stock ticker strengthened return continuation. Intuitively, a decrease in the cost of transmitting price changes increased trend chasing.

The ability of ticker subscriptions to strengthen return continuation and return co-movement is difficult to reconcile with risk because increased access to public information is unrelated to any known risk factor. Moreover, placebo tests that randomly reshuffle the state-year ticker observations yield insignificant results. Thus, our return continuation and return co-movement results are unlikely to be spurious.

In summary, prices changes represent a source of public information that is widely available to investors. We conclude that the dissemination of price changes reduces price efficiency by increasing trend chas-

[3] Although trading volumes (liquidity) increase with ticker subscriptions, an increase in return co-movement is not predicted to increase with liquidity.

[4] In contrast to ticker subscriptions, newspaper subscriptions are not dependent on data transmission costs.

ing. Our empirical results support the theoretical predictions of Hong and Stein (1999) as well as Eyster, Rabin, and Vayanos (2018) because increasing investor access to price changes can decrease price efficiency if investors fail to correctly process the information in price changes.

The remainder of the paper describes the stock ticker and our ticker subscription data in Section 1. Section 2 examines the relation between ticker subscriptions and return continuation, while Section 3 examines the relation between ticker subscriptions and return co-movement. Section 4 then examines the ability of data transmission costs to explain ticker subscriptions, return continuation, and return co-movement before our concluding remarks in Section 5.

1 Stock Ticker

The stock ticker made its debut on November 15, 1867. Invented by Edward Callahan, who reconfigured the telegraph to print stock prices on a strip of paper known as the ticker tape, and later improved by Thomas Edison, the stock ticker revolutionized stock trading by transmitting stock prices across the United States. The stock ticker replaced foot messengers on Wall Street who ran between the floor of the NYSE and nearby brokerage houses as investors attempted to obtain an informational advantage. With the advent of the stock ticker, investors began to congregate in brokerage houses to buy and sell stocks based on price movements reported by the ticker tape. The stock ticker went through a number of technological improvements that increased the speed and efficiency of stock trading.

An enhanced stock ticker was introduced in 1964 that was capable of printing 900 characters per minute. While the electronic transmission and storage of data occurred during the 1960s, pneumatic tubes continued to convey information on stock transactions until 1966 when computer readable cards were first introduced. Stock transactions were recorded on cards that were scanned by a computer and then entered into the stock ticker system. The Central Certificate Service was created to computerize the transfer of stock ownership and reduce the amount of paper used in settling stock transactions. However, record keeping systems at brokerage houses were still overstretched given the high transaction volume on stock exchanges during the late 1960s and early 1970s. Therefore, in 1972, the NYSE and AMEX created the Securities Industry Automation Corporation (SIAC) to automate the recording of transactions. The Office of Technology Assessment provides a detailed account of these technological developments in its 1990 publication entitled Electronic Bulls and Bears: U.S. Securities Markets and Information Technology (OTA-CIT-469).

SIAC introduced three system during the 1970s; the Market Data System (MDS), the Designated Order Turnaround System (DOT), and the Common Message Switch (CMS). The MDS processed last sale information, the DOT automated trading for small orders, and the CMS allowed member firms to communicate with each other. For the remainder of the 1970s, the exchanges made several improvements to the speed and efficiency of these three systems. Ultimately, the National Market System (NMS) was created in the mid-1970s to centralize the reporting of stock prices. Throughout these improvements, a version of the stock ticker endured to disseminate stock prices to subscribing brokerage houses.

In summary, the stock ticker revolutionized the way in which investors were able to access stock prices and the quality of this information. According to Hochfelder (2012), the stock ticker enabled brokers to monopolize investor access to credible price data; thereby transforming a market with heterogeneous, discontinuous, and unrecorded prices into a market with homogeneous, continuous, and recorded prices.

> *"Within a few years, the ticker changed exchange operations, recast relations between brokers and customers, and transformed the overall structure of the nation's financial markets"* David Hochfelder, The Telegraph in America, 1832-1920

Garbade and Silber (1978) document the stock ticker's ability to integrate prices between financial markets, while Field (1998) documents its ability to increase trading volume. However, despite its important role in the development of financial markets, the academic literature has not examined the stock ticker's impact on price efficiency. Rashes (2001) reports excessive return co-movement between MCI Communications and Massmutual Corporate Investors before Worldcom's acquisition of MCI Communications due to the similarity in their respective ticker symbols, MCIC and MCI. However, instead of examining ticker symbols, we use the number of ticker subscriptions as a proxy for price dissemination.

Our study of the stock ticker complements a growing literature that uses historical data to examine important issues in asset pricing. For example, Koudijs (2016) uses the arrival of ships sailing from London to Amsterdam during the 18th century to examine return volatility in the absence of information. Similarly, Peress (2014) studies the impact of national newspaper strikes on trading volume and return volatility. Golez and Koudijs (2018) use four centuries of stock return data to examine expected returns, while Goetzmann and Huang (2018) examine momentum in 19th century Russia.

Our pre-internet sample period also complements the online trading literature that examines the impact of technology on investors. Barber and Odean (2001) as well as Choi, Laibson, and Metrick (2002) report that online trading increased trading activity, while Barber and Odean (2002) report that traders who outperformed the market before converting to online trading subsequently underperformed. However, instead of studying technology's impact on the performance of individual investors, we study its impact on price efficiency. Moreover, we focus on a specific technology that disseminated price changes rather than the more general internet technology that disseminated multiple sources of information and facilitated the execution of trades.

1.1 Ticker Subscriptions

We hand-collect the number of NYSE ticker subscribers between 1927 and 1981 from the annual Yearbook of the New York Stock Exchange. This publication is available at the NYSE Archives and records the number of ticker subscriptions in each state. The absence of ticker subscription data from 1982 onward coincides with the emergence of Bloomberg terminals, online trading (Bogan, 2008), and television channels dedicated to finance such as CNBC.

While the number of stock tickers in a state is serially correlated, growth in ticker subscriptions over consecutive years has an insignificant autocorrelation. Augmented Dickey Fuller specifications confirm that state-level growth in ticker subscriptions is stationary. This growth is denoted $\%\Delta\text{Tickers}_{j,t}$, which is defined as $\ln\left(\frac{\text{Tickers}_{j,t}}{\text{Tickers}_{j,t-1}}\right)$, where

$\text{Tickers}_{j,t}$ denotes the number of ticker subscriptions in state j during year t. Within our sample period, there were 894 instances where the number of ticker subscriptions in a state increased, 531 instances where subscriptions decreased, and 205 instances where subscriptions were unchanged.

Figure 2 illustrates the time series variation in aggregate ticker subscriptions at the national level. This figure illustrates a slight positive trend in ticker subscriptions that accompanied considerable year-to-year variation. Table 1 provides summary statistics for state-level ticker growth, %ΔTickers, as well as the other variables in our empirical tests. For ease of reference, Appendix A contains a description of the main variables in our empirical analyses.

To understand the dynamics of ticker subscriptions, the following panel regression is estimated

$$\begin{aligned}
\%\Delta\,\text{Tickers}_{j,t} &= \beta_1\,\%\Delta\,\text{Volume}_{j,t} + \beta_2\,\text{Return}_{j,t} + \beta_3\,\%\Delta\,\text{Spread}_{j,t} \\
&+ \beta_4\,\text{Listings}_{j,t} + \beta_5\,\%\Delta\,\text{Listings}_{j,t} + \beta_6\,\%\Delta\,\text{Population}_{j,t} \\
&+ \beta_7\,\%\Delta\,\text{GSP}_{j,t} + \epsilon_{j,t}\,. \qquad (1)
\end{aligned}$$

State and year fixed effects are included in this specification, with standard errors double-clustered by state and year. The state and year fixed effects capture differences in ticker subscription growth due to state characteristics and technological improvements in the stock ticker that encouraged subscriptions, respectively. A later analysis finds that the cost of transmitting data from New York City to a state explains state-level ticker subscription growth. As federal regulation during our sample period allowed data transmission costs to depend on the distance data was transmitted, state fixed effects capture distances from New York City.

$\%\Delta\text{Volume}_{j,t}$ represents the growth in trading volume over consecutive years, $\ln\left(\frac{\text{Volume}_{j,t}}{\text{Volume}_{j,t-1}}\right)$. %ΔVolume, Return, and (bid-ask) %ΔSpread refer to NYSE-listed firms headquartered in a specific state. The number of NYSE-listed firms in a state and their growth are also included as control variables in equation (1) along with population growth (%ΔPopulation) and economic growth (%ΔGSP) to account for the possibility that state-level ticker subscriptions depend on state-level demographic and economic conditions. Population and Gross State Product (GSP) data are obtained from the United States Census and

Bureau of Economic Analysis, respectively, with GSP data starting in 1964. Appendix A contains a description of these variables.

Table 2 reports that ticker subscriptions do not depend on trading volumes, returns, and spreads whose respective β_1, β_2, and β_3 coefficients are insignificant. This lack of dependence distinguishes ticker subscriptions from investor sentiment. Specifically, in contrast to the investor sentiment proxies of Baker and Wurgler (2006), Bodurtha, Kim, and Lee (1995), as well as Lee, Shleifer, and Thaler (1991), ticker subscriptions are insensitive to financial markets. The availability of ticker subscriptions at the state level also improves our study's identification compared to national proxies for investor sentiment.

Furthermore, Table 2 reports that the number of NYSE-listed firms in a state and the growth in listings have insignificant β_4 and β_5 coefficients, respectively. Thus, the number of ticker subscriptions in a state is insensitive to the number of firms headquartered in the state that are listed on the NYSE. The β_6 coefficient for population growth is also insignificant as is the β_7 coefficient for GSP growth. Therefore, state-level growth in ticker subscriptions does not appear to be related to state-level population growth and economic activity.

Overall, the results in Table 2 indicate that ticker subscriptions are not endogenous with respect to financial, economic, and demographic conditions.

1.2 Trading Volumes and Bid-Ask Spreads

Our next analysis examines the impact of ticker subscriptions on liquidity. Specifically, the following panel regression tests whether an increase in the number of ticker subscriptions in a state increased the trading volumes of firms headquartered in the state

$$\begin{aligned} \%\Delta\,\text{Volume}_{i,t} &= \beta_1\,\%\Delta\,\text{Tickers}_{j,t} + \beta_2\,\%\Delta\,\text{Volume}_{i,t-1} + \beta_3\,\%\Delta\,\text{Spread}_{i,t} \\ &+ \beta_4\,\text{Return}_{i,t} + \beta_5\,\text{Return}_{i,t-1} + \epsilon_{i,t}\,. \end{aligned} \tag{2}$$

$\%\Delta$Volume, $\%\Delta$Spread, and Return pertain to firm i, which is headquartered in state j. Firm and year fixed effects are included in this specification, with standard errors double-clustered by firm and year. As with Table 2, the results in Table 3 focus on annual observations because ticker subscriptions are available each calendar year.

The positive β_1 coefficients for %ΔTickers in Panel A of Table 3 indicate that an increase in ticker subscriptions in a state increased the trading volumes of firms in the state. In the full specification with all control variables, the β_1 coefficient equals 0.0415 (T-statistic of 2.08). Thus, trading volume is included in later empirical tests to account for the indirect impact of ticker subscriptions on price efficiency through trading volume. In contrast to ticker subscriptions, trading volume is endogenous given its sensitivity to returns.

The next panel regression tests whether an increase in the number of ticker subscriptions in a state alters the bid-ask spreads of firms in the state

$$\begin{aligned} \%\Delta\,\text{Spread}_{i,t} &= \beta_1\,\%\Delta\,\text{Tickers}_{j,t} + \beta_2\,\%\Delta\,\text{Spread}_{i,t-1} + \beta_3\,\%\Delta\,\text{Volume}_{i,t} \\ &+ \beta_4\,\text{Return}_{i,t} + \beta_5\,\text{Return}_{i,t-1} + \epsilon_{i,t}\,. \end{aligned} \tag{3}$$

As with equation (2), firm and year fixed effects are included in this specification, with standard errors double-clustered by firm and year.

Unlike trading volumes, the insignificant β_1 coefficients in Panel B of Table 3 (after controlling for the lagged change in spreads) indicate that an increase in ticker subscriptions in a state does not alter the bid-ask spreads of firms in the state. In particular, price dissemination by the stock ticker does not appear to lower the cost of executing trades. Bali, Peng, Shen, and Tang (2014) proxy for liquidity shocks using changes in Amihud's illiquidity measure (Amihud, 2002). Unreported results confirm that %ΔTickers has an insignificant relation with changes in this illiquidity measure. Furthermore, Jarrell (1984) documents the fixed nature of trading costs for NYSE-listed firms during our sample period, especially for individual investors. Thus, there is no evidence that trading costs, price impacts, and commissions were sensitive to ticker subscriptions.

2 Price Efficiency

Hong and Stein (1999) assume the existence of two types of investors; newswatchers and momentum traders. Using proxies for information diffusion such as firm size and analyst coverage, empirical tests of this theory typically examine the diffusion of private information across newswatchers (Hong, Lim, and Stein, 2000). However, we focus on the momentum traders in Hong and Stein (1999) who generate return continuation by conditioning their trades on observed price changes. Specifically, we examine their trend chasing prediction using the number of ticker subscriptions as a proxy for the access of momentum traders to price changes.[5]

Hong and Stein (1999) predict a positive relation between the number of ticker subscriptions and return continuation. The following preliminary result based on state-year changes in average daily return autocorrelations attest to the importance of price dissemination by the stock ticker:

	Observations	%ΔAutocorrelation
%ΔTickers > 0	879	0.0060
%ΔTickers ≤ 0	526	–0.0066
Difference		0.0127**
T-statistic		2.32

Specifically, each year, we compute the daily return autocorrelation of firms headquartered in each state and average these firm-year autocorrelations to produce state-year autocorrelations. The changes in these state-level autocorrelations are then divided into subsets determined by %ΔTickers. Standard errors for the above analysis are double-clustered by state and year. Unreported panel regression results confirm that an increase in ticker subscriptions is associated with increased return autocorrelation after controlling for changes in trading volumes and bid-ask spreads.

More formally, we test Hong and Stein (1999)'s prediction using the β_3 coefficient in the following panel regression

$$\begin{aligned}
\text{Return}_{i,t} \;&=\; \beta_1\,\%\Delta\,\text{Tickers}_{j,s} + \beta_2\,\text{Return}_{i,t-1} + \beta_3\,[\text{Return}_{i,t-1} \times \%\Delta\,\text{Tickers}_{j,s}] \\
&+\; \beta_4\,\%\Delta\,\text{Volume}_{i,t} + \beta_5\,[\text{Return}_{i,t-1} \times \%\Delta\,\text{Volume}_{i,t}] + \beta_6\,\%\Delta\,\text{Spread}_{i,t} \\
&+\; \beta_7\,\%\Delta\,\text{Listings}_{j,t} + \beta_8\,\%\Delta\,\text{Population}_{j,t} + \epsilon_{i,t}\,. \qquad (4)
\end{aligned}$$

All variables are defined daily except %ΔTickers, which is identical for

[5]Daniel, Hirshleifer, and Subrahmanyam (1998) and Barberis, Shleifer, and Vishny (1998) do not predict stronger return continuation as a result of price dissemination.

every day t in calendar year s. Firm and year fixed effects are included in this specification, with standard errors double-clustered by firm and year. The return, volume, and spread variables are defined at the firm level, while the population and listing variables are defined at the state level.

The insignificant β_1 coefficients in Panel A of Table 4 indicate that growth in ticker subscriptions does not directly impact stock returns. However, consistent with Jegadeesh (1990) and Lehman (1990), the negative β_2 coefficients indicate that daily returns have a negative serial correlation. Most important, the positive β_3 coefficients for the Lag Return $\times$ %ΔTickers interaction indicate that price dissemination strengthened return continuation after controlling for the negative unconditional serial correlation in returns. Indeed, the sign difference between the β_2 and β_3 coefficients reflects the importance of price dissemination to return autocorrelation.

Both β_4 and β_5 are positive, confirming the joint determination of returns and trading volumes. In particular, the positive β_5 coefficients for the Lag Return $\times$ %ΔVolume interaction reproduces the results in Campbell, Grossman, and Wang (1993). However, the liquidity traders in Campbell, Grossman, and Wang (1993) cannot explain the impact of price dissemination by the stock ticker on return continuation. Furthermore, the β_3 coefficient for the Lag Return $\times$ %ΔTickers interaction in the full specification examines the impact of ticker subscriptions on return continuation after controlling for trading volumes. In addition, state-level control variables involving the number of NYSE-listed firms and population generally have insignificant β_7 and β_8 coefficients. These coefficients are also insignificant in later subperiod analyses.

For emphasis, although conditioning on state-level ticker subscriptions improves our identification, local bias at the state level is not required for our trend-chasing hypothesis.[6] Moreover, the last column "National Results" of Panel A in Table 4 indicates that the positive relation between ticker subscriptions and return continuation exists without this assumption. Nevertheless, local bias is relevant to our later return co-movement results.

[6] In contrast to our analysis of state-level ticker subscriptions, observe that year fixed effects cannot be included in our analysis of national-level ticker subscriptions because these observations are available annually.

To assess the economic significance of ticker subscriptions and incorporate the magnitude of returns into our analysis, we double-sort firms according to annual state-level changes in ticker subscriptions and daily firm-level returns. The %ΔTickers observations are sorted into terciles, while returns are sorted into quintiles. We then compute return spreads conditional on the highest and lowest return quintiles for firms headquartered in states with the largest ticker subscription increases and decreases. These spreads represent short-term "price momentum" profits (Jegadeesh and Titman, 1993) conditional on price dissemination.

The results in Panel B of Table 4 confirm that price dissemination by the stock ticker is associated with stronger return continuation. Following a high return, the return spread attributable to differences in price dissemination (high minus low change in ticker subscriptions) is significant, with greater price dissemination associated with stronger return continuation. In particular, following a high return on day t, the difference in the cumulative return spread from day $t+1$ to day $t+5$ is over 35 basis points. Thus, greater price dissemination corresponds to return continuation that is both economically and statistically significant.

Following a low return, the results are consistent with short-sell constraints. As short-selling a stock following a large negative return is difficult, those with access to a stock ticker are simply less inclined to buy the stock following a large negative return. Consequently, return reversal is attenuated.

For emphasis, our study of ticker subscriptions is intended to provide an explanation for return continuation based on uninformed trend chasing, not a feasible trading strategy. While historical ticker subscriptions offer an ideal setting to examine the economic implications of price dissemination, information dissemination is ubiquitous in the modern era. Consequently, we are careful not to overemphasize the results in Panel B of Table 4.

To examine whether the stock ticker's impact on return continuation changed during our sample period, we estimate equation (4) in two separate subperiods; 1927 to 1949 and 1950 to 1969, to examine the implications of price dissemination before and after World War Two (WWII). Results in an internet appendix indicate that the impact of ticker subscriptions on return continuation is stable, with the

β_3 coefficients being positive in both subperiods. The main difference is that the negative serial correlation in returns is not present in the post-WWII era.

We also examine cumulative return continuation during an extended horizon to capture "spillovers" over consecutive days. For example, good information released on Monday that increases a firm's stock price can initiate uninformed buy trades on Tuesday due to trend chasing that further increase the stock price on Tuesday and consequently initiate additional uninformed buy trades on Wednesday, etc. Cumulative returns over a longer horizon are also robust to bid-ask bounce. Results in an internet appendix indicate that the β_3 coefficients are positive at the 5% level for 20 subsequent trading days. This persistence in return predictability is difficult to reconcile with price dissemination altering liquidity since price impacts attributable to liquidity provision are temporary (Avramov, Chordia, and Goyal, 2006). The economic significance of the return continuation attributable to price dissemination is examined using portfolio returns in our next analysis.

2.1 Reversal Trading Strategy

To complement our previous analysis, we implement a reversal trading strategy that buys (sells) stocks on day t following price decreases (increases) on day $t-1$. Firm-level trading profits are then computed over a one-day holding period on day t to capture the economic magnitude of return autocorrelation. These daily trading profits are then averaged across the firms headquartered in each state within each calendar year. Observe that positive trading profits from the reversal strategy are consistent with return reversal, hence negative return autocorrelation, while negative trading profits are consistent with positive return autocorrelation and therefore return continuation that reflects trend chasing.

Of the 11,080,094 firm-day observations, 7,047,780 or 63.6% occur in both a state and year where the number of ticker subscriptions increased. Within this subset, the reversal profit is negative, indicating that increased price dissemination is associated with return continuation, hence trend chasing. More formally, the relation between ticker subscriptions and trading profits from the reversal strategy is examined by the following regression

$$\begin{aligned}\text{Reversal Profit}_{i,t} &= \beta_1\,\%\Delta\,\text{Tickers}_{j,s} + \beta_2\,\%\Delta\,\text{Volume}_{i,t} \\ &+ \beta_3\,\%\Delta\,\text{Spread}_{i,t} + \epsilon_{i,t}\,, \end{aligned} \tag{5}$$

for day t in year s, while %ΔVolume and %ΔSpread pertain to firm i headquartered in state j. Firm fixed effects are included in this specification, with standard errors clustered by firm. A positive β_1 coefficient for %ΔTicker indicates that ticker subscription growth (%ΔTickers$>$ 0) strengthens return reversals, while a negative β_1 coefficient indicates strengthening return continuation.

According to Panel A of Table 5, an increase in ticker subscriptions is associated with lower (more negative) trading profits from the reversal strategy, hence greater return continuation. Conversely, although ticker subscriptions are more than twice as likely to increase than decrease, a decrease in ticker subscriptions is associated with higher (less negative) trading profits from the reversal strategy, hence weaker return continuation. As in prior specifications, unreported results confirm that the β_1 coefficient is unchanged when changes in NYSE listings and population at the state level are included as controls later in the sample period.

Our trend chasing hypothesis attributes negative reversal profits to price dissemination by the stock ticker and consequently the salience of prior returns. Nevertheless, we estimate quartile regressions that condition on the magnitude of trading profits; specifically, the 25^{th} and 75^{th} percentiles. The 25^{th} percentile is negative, –0.1899, and therefore conditions on return continuation, while the 75^{th} percentile is positive, 0.1852, and therefore conditions on return reversals. This implementation ensures that the appearance of stronger return continuation reported in Panel A of Table 5 is not entirely due to weaker return reversals but also stronger return continuation.[7] Indeed, the coefficient for the 75^{th} percentile captures weaker return reversals as well as transitions between firm-day return reversal that becomes return continuation as a result of price dissemination. The results in Panel B of Table 5 from the quartile regressions indicate that an increase in ticker

[7]The relatively large mass of reversal profits around zero prevents the quartile regression from being estimated near the median. More extreme deciles such as the 10^{th} and 90^{th} are not examined to guard against the impact of dividends on this analysis.

subscriptions reduces the profits from the reversal trading strategy as coefficients for both the 25^{th} and 75^{th} percentiles are negative.

The above results are consistent with the visual illustration in Figure 3 based on firm-days that equal +1 when trading profits from the reversal strategy are positive (return reversals) for a firm on a given day and –1 when trading profits are negative (return continuation). These observations are then aggregated to summarize the reversal strategy's propensity to produce negative trading profits that imply return continuation. Figure 3 illustrates a general leftward shift in the unimodal distribution of trading profits when ticker subscriptions increased, indicating a higher likelihood of return continuation.

2.2 Additional Results

To differentiate between growth in ticker subscriptions versus growth in the investor population, we assume the number of investors in a state is proportional to the number of brokerage offices in the state. We then compute a *Ticker Intensity* ratio by normalizing the number of ticker subscriptions in a state by the number of brokerage offices in the state to measure the intensity of state-level price dissemination. For example, a state-year ratio of 0.10 indicates that 10% of brokerage offices in the state had a ticker subscription.

As with the number of ticker subscriptions, the p-values from several Augmented Dickey Fuller specifications confirm that the ratio of ticker subscriptions to brokerage offices is non stationary. Therefore, our empirical tests utilize the growth in this ratio, which is stationary. We then re-estimate equation (4) replacing %ΔTickers with %ΔTicker Intensity and report the results for weekly returns in Table 6.

The results in Table 6 parallel our earlier return continuation results because the β_3 coefficients for the Lag Return × %ΔTicker Intensity interaction remain positive.[8] Thus, the positive relation between ticker subscriptions and return continuation is attributable to investors having greater access to price changes and not a greater number of investors.

To verify the importance of ticker subscriptions to return continuation, we conduct a placebo test that randomly reshuffles the state-year

[8]As in Panel D of Table 4, unreported results are similar over shorter and longer horizons.

ticker subscriptions in equation (4). Once again, firm-level cumulative returns over the subsequent week are examined. The insignificant β_3 coefficients in Table 7 for this placebo test confirm the importance of ticker subscriptions to return continuation. Furthermore, although the stock ticker exposed investors to non-local stocks, the adoption of this technology does not appear to have mitigated local investment bias. Instead, as indicated by later evidence on return co-movement, the adoption of this technology is associated with uninformed trend chasing.

To supplement the results from equation (4) based on the interaction between ticker subscriptions and prior returns, variance ratios are constructed by dividing the variance of monthly returns by four times the variance of weekly returns (Boehmer and Kelly, 2009). These variance ratios are therefore computed over 20 trading days as the β_3 coefficients in Panel D of Table 4 are positive over this horizon. A variance ratio (VR) greater than 1 corresponds to a deviation from the random walk model due to positively correlated price changes (returns).

The following panel regression examines the impact of ticker subscriptions in a state on deviations from the random walk model captured by variance ratios

$$\begin{aligned}\Delta\ |\mathrm{VR}-1|_{i,t} \quad &= \quad \beta_1\,\%\Delta\,\mathrm{Tickers}_{j,t}+\beta_2\,\%\Delta\,\mathrm{Volume}_{i,t}+\beta_3\,\%\Delta\,\mathrm{Spread}_{i,t} \\ &+ \quad \beta_4\,\mathrm{Return}_{i,t}+\epsilon_{i,t}\,. \end{aligned} \tag{6}$$

The specification includes firm and year fixed effects, with standard errors double-clustered by firm and year.

Table 8 reports positive β_1 coefficients from equation (6). These positive coefficients indicate that price dissemination is associated with larger deviations from a random walk model. For example, in the full specification, the β_1 coefficient equals 0.0357 (T-statistic of 2.32). Thus, an increase in ticker subscriptions in a state is associated with larger deviations from the random walk model, hence a decrease in price efficiency for firms headquartered in the state.

Return continuation in the form of trend chasing is examined at the firm level using daily returns, or weekly returns in robustness tests, because return continuation is generally a short-term anomaly. Conversely, our next analysis of return co-movement is examined at the state level using annual observations because co-movement must be computed across firms over a longer horizon.

3 Return Co-Movement

Barber, Odean, and Zhu (2009) conclude that correlated trading is responsible for return continuation. Kumar and Lee (2006) also document the link between uninformed trading by retail investors and return co-movement. Therefore, we examine return co-movement to determine whether uninformed trading explains return continuation.

A common shock to fundamentals can lead to positively correlated trades across stocks and consequently positively correlated price changes (returns). In response to this common shock, trend chasing can subsequently lead to additional positively correlated uninformed trades that are unrelated to fundamentals but continue to induce positively correlated price changes. Eyster, Rabin, and Vayanos (2018) formally demonstrate how the failure of investors to properly process price changes leads them to overweight this public information at the expense of their private information on fundamentals.

In contrast to uninformed trading, an increase in liquidity provision is not predicted to increase return co-movement. Instead, an increase in liquidity incentivizes the collection of firm-specific information and decreases return co-movement (Morck, Yeung, and Yu, 2000).[9]

To better understand the role of industry fundamentals in return co-movement, we adopt the approach in Pirinsky and Wang (2006) and estimate local betas as well as industry and market betas according to the following specification

$$\begin{aligned}\mathrm{Return}_{i,t} &= \beta_{0,i} + \beta_{L,i}\,\mathrm{Return}_{j,t} + \beta_{I,i}\,\mathrm{Return}_{k,t} \\ &+ \beta_{M,i}\,\mathrm{Return}_{t} + \epsilon_{i,t}\,. \end{aligned} \tag{7}$$

This specification uses weekly state-level, industry-level, and market-level returns to estimate a local beta (β_L), industry beta (β_I), and market beta (β_M), respectively, for firm i in state j and industry k according to the 48 Fama-French industry classifications.

[9] An increase in liquidity provision would also reduce the need to "split" a large trade into smaller autocorrelated trades capable of inducing return continuation.

We then average the local betas of firms in a state according to their respective market capitalization to compute the state's local beta, $\beta_{L,j}$. This state-level local beta captures the return co-movement of firms in a state after controlling for return co-movement attributable to industry and market factors. The second stage of the analysis examines whether the number of ticker subscriptions in a state exerts a positive impact on the state's local beta

$$\begin{aligned}
\%\Delta\, \beta_{L,j,t} \quad &= \quad \beta_1\, \%\Delta\, \text{Tickers}_{j,t} + \beta_2\, \%\Delta\, \text{Volume}_{j,t} + \beta_3\, \%\Delta\, \text{Spread}_{j,t} \\
&+ \quad \beta_4\, \%\Delta\, \text{Industry Beta}_{j,t} + \beta_5\, \%\Delta\, \text{H-Index}_{j,t} \\
&+ \quad \beta_6\, \%\Delta\, \text{Volatility}_{j,t} + \epsilon_{j,t}\,. \qquad (8)
\end{aligned}$$

State and year fixed effects are included in the above specification, with standard errors double-clustered by state and year. State-level returns are not included in equation (8) because these returns define the local betas in equation (7) that are the dependent variable in this specification.

A state's industry composition is likely to change more gradually than the number of ticker subscriptions in the state. Moreover, there is no channel through which price dissemination is likely to alter a state's industrial composition. Nevertheless, our return co-movement analysis controls for log changes in the Herfindahl index (%ΔH-Index) that reflect state-level industrial composition. State-year H-Index measures are computed using the market capitalization of NYSE-listed firms in different industries. Log changes in the industry betas from equation (7) for NYSE-listed firms in each state are also included as an additional control for industry fundamentals. $\text{Volatility}_{j,t}$ represents the average idiosyncratic return volatility for NYSE-listed firms in state j.

The positive β_1 coefficients in Panel A of Table 9 indicate that an increased number of ticker subscriptions in a state increases the average local beta of firms in the state, which indicates greater return co-movement among local stocks. In the full specification, the β_1 coefficient equals 0.7094 (T-statistic of 2.09). This positive coefficient indicates that greater price dissemination in a state is associated with higher return co-movement in the state.

In contrast, the β_1 coefficients in Panel B of Table 9 are insignificant when %ΔIndustry Beta replaces %ΔLocal Beta as the dependent variable in equation (8). Thus, ticker subscriptions do not influence the sensitivity of stock returns to industry factors. This finding provides reassurance that the relation between price dissemination and return co-movement is not attributable to industry fundamentals.

For our next analysis of return co-movement, at least five NYSE-listed firms are required to be headquartered in a state for the state-year observations to be included in the following panel regression

$$\begin{aligned}\%\Delta\,\text{Return Co-Movement}_{j,t} &= \beta_1\,\%\Delta\,\text{Tickers}_{j,t} + \beta_2\,\%\Delta\,\text{Volume}_{j,t} + \beta_3\,\%\Delta\,\text{Spread}_{j,t} \\ &+ \beta_4\,\text{Return}_{j,t} + \beta_5\,\%\Delta\,\text{Industry Beta}_{j,t} \\ &+ \beta_6\,\%\Delta\,\text{H-Index}_{j,t} + \beta_7\,\%\Delta\,\text{Volatility}_{j,t} + \epsilon_{j,t}\,. \end{aligned} \tag{9}$$

The state-year dependent variable is computed as the average cross-correlation of weekly returns among firms in state j during year t. State and year fixed effects are included in this specification, with standard errors double-clustered by state and year. State fixed effects account for the geographic clustering of firms in the same industry. Additional controls for state-level industrial composition include state-level log changes in the H-Index and industry beta. The positive β_1 coefficients in Table 10 indicate that the dissemination of stock prices increases the local betas, which reflect stronger return co-movement among local stocks in a state.

The positive *state-level* relation between ticker subscriptions and return co-movement also suggests that the stock ticker did not mitigate local investment bias. Instead, investors appear to have continued to focus their trading on "familiar" local firms despite gaining exposure to non-local firms via the stock ticker. Note that the ticker subscription did not confer any informational advantage that would justify the continuation of local investment bias (Coval and Moskowitz, 1999).

Three additional robustness tests confirm the state-level relation between ticker subscriptions and return co-movement. The first robustness test enhances equation (7) by adding an interaction variable involving state-level returns $\text{Return}_{j,t}$ and ticker subscriptions $\%\Delta\text{Tickers}_{j,s}$ to assess the impact of price dissemination on the local betas

$$\begin{aligned}\text{Return}_{i,t} &= \beta_1\,\%\Delta\,\text{Tickers}_{j,t} + \beta_2\,\text{Return}_{j,t} + \beta_3\,[\text{Return}_{j,t} \times \%\Delta\,\text{Tickers}_{j,s}] \\ &+ \beta_4\,\text{Return}_{k,t} + \beta_5\,\text{Return}_t + \epsilon_{i,t}\,, \end{aligned} \tag{10}$$

for firm i in state j and industry k. The above specification controls for industry and market returns, with the interaction between state-level returns and %ΔTickers being the independent variable of primary interest. Firm and year fixed effects are included in this specification, with standard errors double-clustered by firm and year.

A positive β_3 coefficient for the interaction variable indicates that an increase in price dissemination by the stock ticker in a state increases the local beta of firms in the state, and therefore the return co-movement of firms headquartered within the same state. Thus, the positive β_3 coefficients in Panel A of Table 11 capture the positive impact of price dissemination on local return co-movement.

The second robustness test conducts a difference-in-difference between states based on their ticker subscription growth. Specifically, every year, states are classified as those with high versus low ticker subscription growth. Panel B of Table 11 reports an increase in return co-movement in the first subset and a decrease in return co-movement in the second subset. This difference in return co-movement is statistically significant at the 1%-level.

The third robustness test randomizes the state-year %ΔTickers observations and then re-estimates equation (9). In contrast to the positive β_1 coefficients for %ΔTickers in Table 10, the placebo results in Panel C of Table 11 report insignificant β_1 coefficients. Therefore, the positive impact of ticker subscriptions on return co-movement is limited to local stocks, which supports the uninformed trading channel in Pirinsky and Wang (2006).

In summary, recall that the stock ticker disseminated price changes, not information on fundamentals. Furthermore, any decrease in trading costs associated with ticker subscriptions is predicted to increase informed trading by facilitating arbitrage activity and therefore lowering return co-movement (Morck, Yeung, and Yu, 2000). Overall, the positive relation between ticker subscriptions and return co-movement indicates that greater uninformed trend chasing, not greater liquidity, explains the positive impact of ticker subscriptions on return continuation.

4 Data Transmission Costs

Ticker subscribers bore the cost of transmitting stock price data from the NYSE to their location. Thus, data transmission costs represent an important operating cost for the stock ticker. According to the Communications Act of 1934, data transmission rates were regulated by the Federal Communications Commission (FCC) based on average cost pricing (Kessler, 1979). Although distance was an important determinant of data transmission costs, these costs varied significantly over time. In particular, data transmission costs eventually decrease with investments in improved technology after increasing to finance the investments.

Data transmission costs enable us to address endogeneity concerns regarding ticker subscriptions because these costs are primarily determined by technological improvements. Moreover, while financial markets are often among the first to adopt technological improvements, there is no evidence to suggest that the data transmission costs set by AT&T during our sample period responded to usage by financial market participants. Data transmission costs from New York City to six states (California, Illinois, Pennsylvania, Michigan, Massachusetts, and Texas) are obtained between 1952 and 1981 from the Federal Communications Commission (FCC), specifically their report entitled Statistics of Communications Common Carriers. We are able to analyze 824 firms headquartered in these six states, compared with 2,231 in the full sample of states. We observe 34 instances where data transmission rates increased and 23 instances where these rates decreased.

Unreported results confirm that data transmission costs from New York City to a state are independent of population growth and economic growth in the state. Instead, consistent with the FCC's regulatory policy, data transmission costs depend on distance. For example, the average cost to transmit data from New York City to California is more than double the average cost to Pennsylvania. Recall that a state's distance from New York City is captured by the inclusion of state fixed effects in our prior empirical tests. As distance is constant, we examine whether changes in data transmission costs affect ticker subscriptions at the state level.[10]

Specifically, we regress the change in ticker subscriptions in a state on the change in data transmission costs relative to the prior year.

[10] As the cost of newspaper subscriptions is unaffected by data transmission costs, variation in return continuation and return co-movement explained by data transmission costs cannot be attributed to newspaper subscriptions.

The prior year's data transmission cost is used because the decision to initiate or cancel a ticker subscription was effective at the start of the next calendar year. Therefore, $\%\Delta\text{Tickers}_{j,t}$ is regressed on $\Delta\text{Datacost}_{j,t-1}$ to determine whether data transmission costs from New York City to a state explain ticker subscriptions in the following year.

According to Panel A of Table 12, data transmission costs to a state have an inverse relation with ticker subscriptions in the state. In particular, the negative β_1 coefficient of –0.4704 (T-statistic of –4.41) indicates that a higher cost for acquiring stock price data lowered the demand for this public information. The F-statistic is 25.43 (p-value of 0.000) rejects the possibility of a weak instrument. As the number of ticker subscriptions is explained by the operating cost of a stock ticker, we re-estimate equation (9) with $\Delta\text{Datacost}_{j,t-1}$ equal to +1 or –1 for positive and negative changes in data transmission costs.

The negative β_3 coefficients for Lag Return × ΔDatacost in Panel B of Table 12 indicate that lower (higher) data transmission costs, which correspond to an increase (decrease) in ticker subscriptions, strengthen (weaken) return continuation. In the full specification, the β_3 coefficient equals –0.0583 (T-statistic of –4.66). Similarly, the negative β_1 coefficients in Panel C of Table 12 for ΔDatacost indicate that lower data transmission costs strengthened return co-movement. For example, in the full specification, the β_1 coefficient is –0.0876 (T-statistic of –2.63). This finding indicates that the increased dissemination of price changes following a decrease in the cost of transmitting this public information increased uninformed trading.

We also estimate a formal instrumental variable (IV) analysis using ΔDatacost as an instrument for %ΔTickers. The first stage of this IV analysis parallels equation (1), with the addition of ΔDatacost as an independent variable. The dependent variable in the second stage of this IV analysis is the change in a state's average autocorrelation. Thus, the IV analysis estimates the impact of greater price dissemination attributable to lower data transmission costs on return continuation. The exclusion restriction is satisfied because changes in data transmission costs did not impact trading commissions, which were fixed by the NYSE (Jarrell, 1984). Moreover, the frequency of changes in data transmission costs was at most annual. Therefore, while data transmission costs can affect the profits of certain NYSE-listed firms, including brokerage firms, changes in these costs are unlikely to change high frequency return autocorrelations during the subsequent year. Instead, the only channel through which annual changes in data transmission costs can alter weekly return autocorrelations is through ticker subscriptions.

The first stage of the instrumental variable procedure estimates the following panel regression

$$\begin{aligned}\%\Delta\,\text{Tickers}_{j,t} &= \beta_1\,\Delta\,\text{Datacost}_{j,t} + \beta_2\,\%\Delta\,\text{Volume}_{j,t} + \beta_3\,\%\Delta\,\text{Spread}_{j,t}\\ &+ \beta_4\,\text{Return}_{j,t} + \beta_5\,\%\Delta\,\text{Listings}_{j,t}\\ &+ \beta_6\,\%\Delta\,\text{Population}_{j,t} + \epsilon_{j,t}\,. \qquad (11)\end{aligned}$$

The results from the first stage are reported in Panel D of Table 12. This first stage of the instrumental variable analysis parallels equation (1), whose results are reported in Table 2, with the addition of ΔDatacost.

Observe that the β_1 coefficient is negative, equaling –0.5000 (T-statistic of –2.78). This negative coefficient supports the inverse relation between operating costs for a stock ticker and ticker subscriptions. Moreover, our instrumental variable estimation does not suffer from a weak instrument problem as the F-statistic from equation (11) is 25.43.

Predicted values for %ΔTickers, denoted $\widehat{\%\Delta\text{Tickers}}$, from the first stage are then incorporated into the second stage panel regression where the dependent variable is the average change in return autocorrelation at the state level

$$\begin{aligned}\Delta\text{Autocorrelation}_{j,t} &= \beta_1\,\%\widehat{\Delta\,\text{Tickers}}_{j,t} + \beta_2\,\%\Delta\,\text{Volume}_{j,t} + \beta_3\,\%\Delta\,\text{Spread}_{j,t}\\ &+ \beta_4\,\text{Return}_{j,t} + \beta_5\,\%\Delta\,\text{Listings}_{j,t}\\ &+ \beta_6\,\%\Delta\,\text{Population}_{j,t} + \epsilon_{j,t}\,. \qquad (12)\end{aligned}$$

The positive β_1 coefficient of 0.2114 (T-statistic of 2.31) from the second stage indicates that an increase in ticker subscriptions in state j attributable to lower data transmission costs from New York City to state j increases the average return autocorrelation of firms headquartered in state j. Overall, the instrumental variable procedure confirms that increasing the access of investors to price changes decreases price efficiency by increasing trend chasing.

5 Conclusion

Our study is motivated by the trend-chasing momentum investors in Hong and Stein (1999) that initiate uninformed trades based on observed price changes. As the stock ticker disseminated price changes, we use the number of ticker subscriptions as a proxy for price dissemination to examine its impact on price efficiency.

Specifically, we examine the impact of ticker subscriptions in a state on the return continuation and return co-movement of firms in the state. We find that an increase in ticker subscriptions strengthened both return continuation and return co-movement. Intuitively, the dissemination of stock prices by the stock ticker lead trend-chasing investors to initiate buy trades following price increases. Consequently, price dissemination appears to have reduced price efficiency.

Furthermore, ticker subscriptions had an inverse relation with the cost of transmitting data to the ticker's location. We find that lower operating costs for a stock ticker increased ticker subscriptions and strengthened both the return continuation as well as the return co-movement of firms in the state. Intuitively, lower data transmission costs reduced price efficiency as the associated increase in investor access to price changes increased trend chasing.

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Appendix A: Variable Definitions

Variable	Description
%ΔTickers	Log change of NYSE ticker subscriptions at the state level.
%ΔVolume	Log change of volume at the firm level or average at the state level.
%ΔSpread	Log change of bid-ask spread at the firm level or average at the state level.
Return	State's average stock return premium for NYSE-listed firms.
Listings	Number of NYSE-listed firms at the state level.
%ΔListings	Log change of NYSE-listed firms at the state level.
%ΔPopulation	Log change of the state's population.
%ΔGSP	Log change of the state's gross state product.
%ΔLocal Beta	Log Change of the local beta in equation (7) for state-level average.
%ΔIndustry Beta	Log Change of the industry beta in equation (7) for state-level average.
%ΔReturn Co-Movement	Log Change of average return correlation at the state level.
%ΔH-Index	Log Change of normalized Herfindahl index for state-level industrial composition.
%ΔVolatility	Log Change of idiosyncratic return volatility for state-level average.

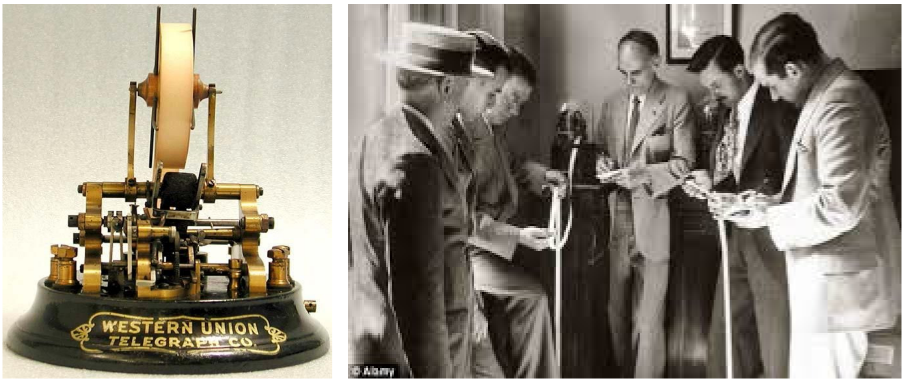

Figure 1: These images illustrate the NYSE stock ticker and its role in disseminating stock prices to investors located in brokerage offices with a ticker subscription. The stock ticker was instrumental in ensuring that stock price information was disseminated simultaneously to investors in a homogeneous format, regardless of an investor's location.

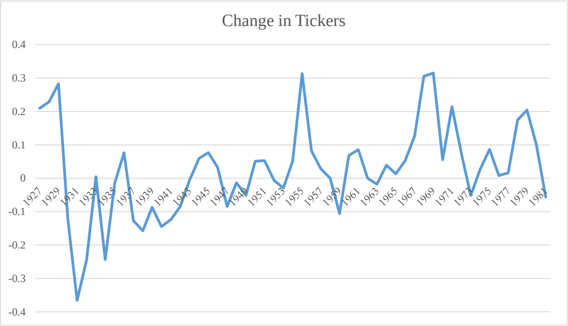

Figure 2: This figure illustrates time series variation in the total number of NYSE ticker subscriptions across all states during our sample period. This time series variation is partially attributable to variation in the cost of transmitting data from the NYSE to a particular state because this cost is incurred by brokerage offices with a ticker subscription. The figure illustrates that many periods were associated with a decline in stock price dissemination. These periods often are preceded by increases in data transmission costs.

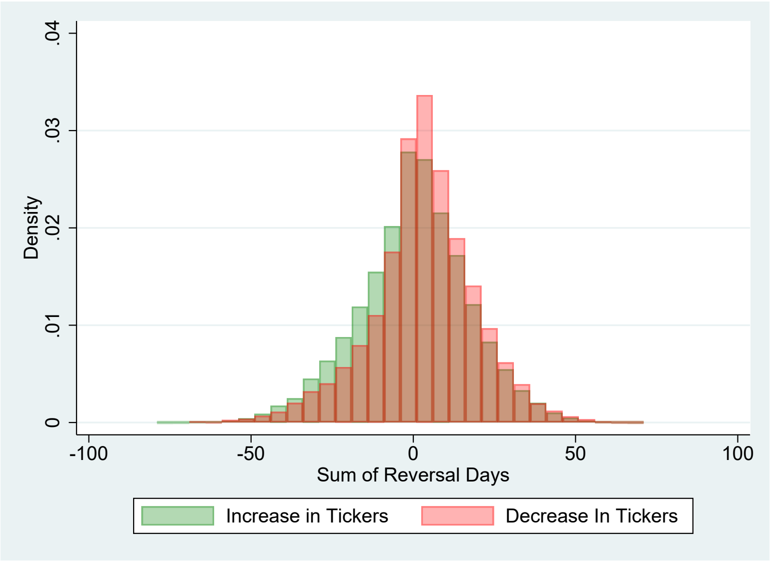

Figure 3: This figure illustrates the distribution of trading profits from the reversal strategy conditional on ticker subscriptions either increasing or decreasing. The distribution is based on firm-day observations that equal +1 when trading profits from the reversal strategy are positive for a firm on a given day and –1 when trading profits are negative. These observations are then aggregated to summarize the reversal strategy's propensity to produce negative trading profits that imply return continuation. Thus, the leftward shift in the distribution that accompanies an increase in ticker subscriptions indicates a higher likelihood of return continuation. Overall, the figure indicates that an increase in price dissemination by the stock ticker is associated with a decrease in the profitability of a reversal trading strategy, hence stronger return continuation.

State Level	N	Mean	Median	Std. Dev.
$\%\Delta$Tickers	1,630	0.0467	0.0299	0.2150
$\%\Delta$Volume	1,630	0.0778	0.0752	0.3599
$\%\Delta$Spread	1,619	0.0133	0.0052	0.2759
$\%\Delta$Population	1,630	0.0141	0.0111	0.0192
$\%\Delta$GSP	618	0.0927	0.0918	0.0327
$\%\Delta$Listings	1,593	0.0225	0.0000	0.0846
$\%\Delta$Local Beta	1,011	0.0228	0.0388	1.2297
$\%\Delta$Industry Beta	1,011	–0.0167	–0.0058	0.5113
$\%\Delta$H-Index	1,011	–0.0149	–0.0203	0.2896
Firm Level	**N**	**Mean**	**Median**	**Std. Dev.**
Weekly Return	2,574,853	0.0024	0.0000	0.0624
Daily Return	11,088,095	0.0008	0.0000	0.0276
$\%\Delta$Volume	11,088,123	–0.0001	0.0000	0.9795
$\%\Delta$Spread	41,043	0.0205	0.0012	0.6203
$\|$VR-1$\|$	43,987	0.3029	0.2580	0.2493

Table 1: Summary Statistics

Description: This table reports summary statistics; mean, median, and standard deviation for the main variables used in our empirical tests. For ease of reference, Appendix A contains a description of these variables. Growth in state-level ticker subscriptions is denoted $\%\Delta\text{Tickers}_{j,t}$, which is defined as $\ln\left(\frac{\text{Tickers}_{j,t}}{\text{Tickers}_{j,t-1}}\right)$, where $\text{Tickers}_{j,t}$ denotes the number of ticker subscriptions in state j during year t. Other state-level growth rates denoted by $\%\Delta$ are defined similarly. Spread refers to the average bid-ask spread of firms headquartered in the state, GSP refers to Gross State Product (starting in 1964), and Listings refers to the number of NYSE-listed firms headquartered in the state. The local betas and industry betas are defined by equation (7) following Pirinsky and Wang (2006) using the 48 Fama-French industry classifications. The H-Index refers to the Herfindahl index a state's industrial composition based on the market capitalization of NYSE-listed firms in each industry. At the firm-level, variance ratios (VR) are constructed by dividing the variance of a firm's monthly returns by four times the variance of its weekly returns in a calendar year.

	%ΔTickers						
%ΔVolume	–0.0016	–0.0040	–0.0029	–0.0029	–0.0031	–0.0028	0.0031
	(–0.08)	(–0.19)	(–0.12)	(–0.12)	(–0.13)	(–0.12)	(0.05)
Return		0.0256	0.0198	0.0198	0.0107	0.0104	0.0264
		(0.53)	(0.42)	(0.42)	(0.22)	(0.22)	(0.34)
%ΔSpread			–0.0194	–0.0194	–0.0231	–0.0242	0.1342
			(–0.74)	(–0.73)	(–0.82)	(–0.85)	(1.04)
Listings				0.0000	0.0001	0.0001	–0.0014
				(0.01)	(0.22)	(0.28)	(–1.36)
%ΔListings					–0.0102	–0.0115	–0.1292
					(–0.12)	(–0.13)	(–1.21)
%ΔPopulation						0.1998	1.2611
						(0.84)	(1.11)
%ΔGSP							–0.5149
							(–1.22)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,630	1,630	1,614	1,614	1,593	1,593	611
R-squared	0.3751	0.3753	0.3767	0.3767	0.3750	0.3752	0.2325

Table 2: Ticker Dynamics (Annual State-Level Observations)

Description: This table reports the results from equation (1) that examines the determinants of state-level ticker subscriptions. Standard errors are double-clustered by state and year, with T-statistics reported in parentheses below each coefficient. ***, **, * represent significance at the 1%, 5%, and 10% level, respectively.
Interpretation: Ticker subscription growth in not influenced by financial market variables (stock returns, trading volumes, and transaction costs). Furthermore, ticker subscription growth is not influenced by demographic and economic conditions.

Panel A: Ticker subscriptions and trading volumes

	%ΔVolume				
%ΔTickers	0.0418*	0.0367*	0.0421*	0.0404**	0.0415**
	(1.92)	(1.84)	(1.95)	(2.01)	(2.08)
Lag %ΔVolume		−0.1687***	−0.1609***	−0.1560***	−0.1570***
		(−9.92)	(−9.54)	(−9.62)	(−9.79)
%ΔSpread			0.0018	0.0079	0.0080
			(0.06)	(0.29)	(0.30)
Return				0.2165***	0.2168***
				(6.18)	(6.18)
Lag Return					0.0098
					(0.44)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	43,987	41,811	36,856	36,855	36,852
R-squared	0.2620	0.2858	0.2829	0.2972	0.2973

Panel B: Ticker subscriptions and spreads

	%ΔSpread				
%ΔTickers	0.0379***	0.0136	0.0128	0.0131	0.0116
	(2.87)	(0.80)	(0.78)	(0.76)	(0.69)
Lag %ΔSpread		−0.4091***	−0.4087***	−0.4085***	−0.4133***
		(−19.85)	(−19.42)	(−19.18)	(−20.23)
%ΔVolume			0.0191	0.0282	0.0276
			(0.47)	(0.71)	(0.69)
Return				−0.0946***	−0.0991***
				(−4.25)	(−4.58)
Lag Return					−0.1261***
					(−3.54)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	40,960	36,088	35,364	35,362	35,359
R-squared	0.1623	0.3304	0.3368	0.3395	0.3442

Table 3: Volume and Bid-Ask Spreads (Annual Firm-Level Observations)

Description: Panel A of this table reports panel regression coefficients from equation (2) that estimates the relation between state-level ticker subscriptions and firm-level trading volume. Panel B reports panel regression coefficients from equation (3) that estimates the relation with firm-level bid-ask spreads. Standard errors are double-clustered by firm and year. T-statistics are reported in parentheses below each coefficient with ***, **, * representing significance at the 1%, 5%, and 10% level, respectively.
Interpretation: Ticker subscription growth in a state influences the trading volumes but not the bid-ask spreads of firms headquartered in the state.

Panel A: Return continuation from 1927 to 1981

	Return						National Results
%ΔTickers	–0.0000	–0.0000	–0.0000	–0.0000	–0.0000	–0.0000	0.0004
	(–0.26)	(–0.27)	(–0.32)	(–0.36)	(–0.51)	(–0.51)	(0.35)
Lag Return	–0.0443***	–0.0435***	–0.0222**	–0.0164	–0.0157	–0.0157	–0.0113
	(–4.76)	(–4.67)	(–2.18)	(–1.49)	(–1.38)	(–1.38)	(–1.16)
Lag Return × %ΔTickers	0.0704***	0.0710***	0.0696***	0.0718***	0.0753***	0.0753***	0.2490***
	(2.81)	(2.82)	(2.81)	(2.73)	(2.68)	(2.68)	(3.93)
%ΔVolume		0.0014***	0.0014***	0.0020***	0.0019***	0.0019***	0.0019***
		(6.75)	(7.11)	(7.00)	(6.76)	(6.76)	(6.77)
Lag Return × %ΔVolume			0.0932***	0.1023***	0.1027***	0.1027***	0.1033***
			(14.90)	(13.52)	(13.06)	(13.06)	(12.95)
%ΔSpread				–0.0005	–0.0004	–0.0004	–0.0004
				(–1.31)	(–1.10)	(–1.10)	(–1.11)
%ΔListings					0.0001	0.0001	–0.0043***
					(0.39)	(0.37)	(–3.75)
%ΔPopulation						–0.0009	–0.0086
						(–0.64)	(–1.66)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	11,088,095	11,088,095	11,088,095	9,392,391	8,855,316	8,855,316	8,853,214
R-squared	0.0048	0.0074	0.0164	0.0186	0.0184	0.0184	0.0180

Panel B: Cumulative return spread conditional on %ΔTickers and return magnitude

	Cumulative Returns on Day					
	t+1	t+2	t+3	t+4	t+5	t+10
High Return on Day t						
High %ΔTickers	0.1141%	0.1589%	0.2197%	0.2906%	0.3276%	0.6529%
Low %ΔTickers	–0.0961%	–0.0945%	–0.0635%	–0.0389%	–0.0260%	0.1566%
Return Spread	0.2102%***	0.2534%***	0.2831%***	0.3296%***	0.3536%***	0.4963%***
T-statistic	(4.85)	(5.30)	(5.16)	(5.15)	(4.73)	(3.88)
Low Return on Day t						
High %ΔTickers	0.4659%	0.5739%	0.6518%	0.7187%	0.8264%	1.2028%
Low %ΔTickers	0.6219%	0.7075%	0.7483%	0.7883%	0.8536%	1.0565%
Return Spread	–0.1561%**	–0.1336%*	–0.0965%	–0.0696%	–0.0272%	0.1462%
T-statistic	(–2.16)	(–1.65)	(–1.09)	(–0.72)	(–0.26)	(0.94)

Table 4: Return Continuation (Daily Firm-Level Observations)

Description: Panel A reports panel regression coefficients from equation (4) that estimates the relation between firm-level return continuation and state-level ticker subscriptions over a daily horizon. Panel B reports the returns from double-sorted portfolios that condition on $\%\Delta\text{Tickers}_{j,t}$ in state j, then condition on the magnitude of returns for firm i in state j. Standard errors are double-clustered by firm and year. T-statistics are reported in parentheses below each coefficient with ***, **, * representing significance at the 1%, 5%, and 10% level, respectively.
Interpretation: An increase in ticker subscriptions in a state is associated with stronger return continuation for the firms headquartered in the state, after controlling for growth in trading volumes and execution costs.

Panel A: Ticker subscriptions and reversal profits

	All Years	1927-1949	1950-1969
%ΔTickers	–0.0010***	–0.0026***	–0.0008***
	(–13.27)	(–6.84)	(–3.32)
%ΔVolume	–0.0001***	–0.0002**	–0.0001**
	(–8.47)	(–2.48)	(–2.60)
%ΔSpread	–0.0002***	0.0002***	–0.002**
	(–9.87)	(4.03)	(–2.39)
Firm Fixed Effects	Yes	Yes	Yes
Observations	9,386,603	2,343,569	3,594,589
R-squared	0.0043	0.0041	0.0043

Panel B: Conditioning on the magnitude of reversal profits

	25^{th} Percentile		75^{th} Percentile	
%ΔTickers	–0.0004***	–0.0004***	–0.0011***	–0.0011***
	(–3.36)	(–3.92)	(–12.41)	(–11.56)
%ΔVolume		–0.0003***		0.0003***
		(–20.96)		(25.61)
%ΔSpread		–0.0016***		0.0010***
		(–67.06)		(50.55)
Observations	9,386,604	9,386,604	9,386,604	9,386,604
R-squared	0.0002	0.0001	0.0002	0.0000

Table 5: Reversal Trading Strategy (Daily Firm-Level Observations)

Description: This table reports on the relation between ticker subscriptions and the trading profits from a reversal trading strategy that buys (sells) stocks following a price decrease (increase). The trading profits from this reversal strategy are the dependent variable in equation (5). T-statistics are reported in parentheses below each coefficient with ***, **, * representing significance at the 1%, 5%, and 10% level, respectively.

Interpretation: An increase in price dissemination by the stock ticker is associated with weaker return reversals, hence stronger return continuation.

	Cumulative Weekly Return				
%ΔTicker Intensity	–0.0003	–0.0006*	–0.0004	–0.0004	–0.0004
	(–1.04)	(–1.71)	(–1.32)	(–1.18)	(–1.26)
Lag Return	–0.0712***	–0.0704***	–0.0717***	–0.0741***	–0.0742***
	(–10.98)	(–11.90)	(–12.09)	(–12.54)	(–11.59)
Lag Return × %ΔTicker Intensity		0.0548***	0.0532***	0.0412***	0.0417***
		(4.01)	(3.97)	(3.04)	(3.04)
%ΔVolume			0.0030***	0.0029***	0.0029***
			(9.99)	(9.66)	(9.64)
Lag Return × %ΔVolume				0.0144**	0.0144**
				(2.32)	(2.32)
%ΔSpread					–0.0001
					(–0.05)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	1,863,187	1,863,187	1,826,086	1,826,086	1,814,855
R-squared	0.0118	0.0119	0.0127	0.0129	0.0130

Table 6: Intensity of Price Dissemination (Weekly Firm-Level Observations)

Description: This table reports the regression coefficients from a modification of equation (4) that replaces %ΔTickers$_{j,t}$ with %ΔTicker Intensity$_{j,t}$. The state-year ticker intensity variable normalizes the number of ticker subscriptions in a state by the number of brokerage offices in the state. Standard errors are double-clustered by firm and year. T-statistics are reported in parentheses below each coefficient with ***, **, * representing significance at the 1%, 5%, and 10% level, respectively.
Interpretation: The positive state-level association between ticker subscription growth and return continuation is not attributable to growth in the investor population.

	Cumulative Weekly Return					
%ΔTickers (Random)	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000
	(0.59)	(0.57)	(0.69)	(0.53)	(0.47)	(0.38)
Lag Return		–0.0676***	–0.0675***	–0.0687***	–0.0713***	–0.0707***
		(–11.48)	(–11.53)	(–11.77)	(–12.92)	(–11.69)
Lag Return × %ΔTickers (Random)			–0.0027	–0.0021	–0.0013	–0.0010
			(–0.68)	(–0.55)	(–0.34)	(–0.24)
%ΔVolume				0.0030***	0.0029***	0.0029***
				(12.20)	(11.68)	(11.68)
Lag Return × %ΔVolume					0.0162**	0.0162**
					(2.63)	(2.59)
%ΔSpread						0.0010
						(0.70)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,443,609	2,441,867	2,441,867	2,396,488	2,396,488	2,380,958
R-squared	0.0071	0.0116	0.0116	0.0124	0.0127	0.0128

Table 7: Placebo Test (Weekly Firm-Level Observations)

Description: This table reports the results from a placebo test based on equation (4) that randomizes the state-year $\%\Delta\text{Tickers}_{j,t}$ observations. Standard errors are double-clustered by firm and year, with T-statistics reported in parentheses below each coefficient. ***, **, * represent significance at the 1%, 5%, and 10% level, respectively.
Interpretation: The placebo test confirms that the positive state-level association between ticker subscription growth and return continuation is not spurious.

	Δ |VR − 1|			
%ΔTickers	0.0346**	0.0345**	0.0357**	0.0357**
	(2.29)	(2.28)	(2.32)	(2.32)
%ΔVolume		0.0044	0.0030	0.0022
		(0.71)	(0.45)	(0.34)
%ΔSpread			0.0070	0.0072
			(1.16)	(1.21)
Return				0.0087
				(1.14)
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	43,963	43,949	38,754	38,752
R-squared	0.0184	0.0184	0.0233	0.0234

Table 8: Variance Ratios (Annual Firm-Level Observations)

Description: This table reports the coefficients from equation (6) that examines the impact of ticker subscriptions on firm-level variance ratios (VR). The variance ratios are defined by dividing the variance of monthly returns by four times the variance of weekly returns. Standard errors are double-clustered by firm and year. T-statistics are reported in parentheses below each coefficient with ***, **, * representing significance at the 1%, 5%, and 10% level, respectively.
Interpretation: The variance ratio results confirm that an increase in ticker subscriptions (price dissemination) in a state is associated with a decrease in price efficiency for the firms headquartered in the state.

Panel A: Impact of ticker subscriptions on local betas

	%ΔLocal Beta				
%ΔTickers	0.6704**	0.6638**	0.7059**	0.7045**	0.7094**
	(2.06)	(2.04)	(2.09)	(2.08)	(2.09)
%ΔVolume		–0.3979	–0.3223	–0.3261	–0.3370
		(–1.56)	(–1.26)	(–1.25)	(–1.31)
%ΔSpread		0.0468	0.0968	0.0889	0.0813
		(0.27)	(0.54)	(0.51)	(0.49)
%ΔIndustry Beta			–0.2726**	–0.2721**	–0.2738**
			(–2.31)	(–2.31)	(–2.29)
%ΔH-index				–0.0459	–0.0488
				(–0.31)	(–0.33)
%ΔVolatility					0.1413
					(0.30)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	1,009	1,009	998	998	998
R-squared	0.0904	0.0930	0.1032	0.1033	0.1034

Panel B: Impact of ticker subscriptions on industry betas

	%ΔIndustry Beta				
%ΔTickers	0.1383	0.1209	0.1287	0.1297	0.1579
	(0.75)	(0.54)	(0.53)	(0.52)	(0.62)
%ΔVolume		–0.5744	–0.5584	–0.5503	–0.5846
		(–1.15)	(–1.17)	(–1.15)	(–1.17)
%ΔSpread			0.5359	0.5545	0.5269
			(1.60)	(1.59)	(1.63)
%ΔH-index				0.1089	0.0977
				(0.84)	(0.77)
%ΔVolatility					0.5168
					(0.99)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	1,007	1,007	1,007	1,007	1,007
R-squared	0.1281	0.1314	0.1354	0.1357	0.1367

Table 9: Local Beta (Annual State-Level Observations)

Description: State-level, industry-level, and market-level weekly returns within each calendar year determine a firm's local beta (β_L), industry beta (β_I), and market beta (β_M), respectively. Panel A of this table reports the coefficients from equation (8) that examines the impact of ticker subscription growth in a state on the average local beta of firms headquartered in the state. Panel B replicates the analysis with state-year industry betas as the dependent variable. Standard errors are double-clustered by state and year. T-statistics reported in parentheses below each coefficient with ***, **, * representing significance at the 1%, 5%, and 10% level, respectively.
Interpretation: An increase in ticker subscriptions (price dissemination) in a state increases the return co-movement of stocks headquartered in the same state but not the return co-movement of stocks within the same industry.

	%ΔReturn Co-Movement			
%ΔTickers	0.1636**	0.1756**	0.1746**	0.1567**
	(2.12)	(2.08)	(2.07)	(1.98)
%ΔVolume	0.0590	0.0798**	0.0781**	0.1127***
	(1.43)	(2.39)	(2.27)	(3.14)
%ΔSpread	–0.1541***	–0.1462***	–0.1474***	–0.0459
	(–3.10)	(–3.11)	(–3.26)	(–1.33)
Return	–0.1031	–0.0929	–0.0871	–0.1015
	(–1.17)	(–1.10)	(–0.93)	(–1.08)
%ΔIndustry Beta		–0.0007	–0.0006	0.0028
		(–0.02)	(–0.02)	(0.10)
%ΔH-Index			–0.0094	–0.0223
			(–0.22)	(–0.50)
%ΔVolatility				–0.4118***
				(–3.40)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,584	1,550	1,550	1,550
R-squared	0.6336	0.6408	0.6408	0.6452

Table 10: Return Co-Movement (Annual State-Level Observations)

Description: This table reports the coefficients from equation (9) that examines the relation between stock ticker subscriptions and return co-movement (average return cross-correlation) between firms in the same state. Standard errors are double-clustered by state and year. T-statistics are reported in parentheses below each coefficient with ***, **, * representing significance at the 1%, 5%, and 10% level, respectively.
Interpretation: An increase in ticker subscriptions (price dissemination) in a state is associated with greater return co-movement among the stocks headquartered in the same state after controlling for industry commonality.

Panel A: Firm-level analysis

	Firm Return	
%ΔTickers	0.0001	0.0000
	(0.36)	(0.25)
State Return	0.3651***	0.3585***
	(7.72)	(7.63)
State Return × %ΔTickers	0.0237**	0.0275**
	(2.17)	(2.04)
Industry Return	0.5458***	0.5418***
	(13.53)	(13.54)
Market Return		0.0913***
		(3.94)
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	2,555,524	2,555,524
R-squared	0.1837	0.1839

Panel B: Difference-in-difference methodology

State Characteristic	Observations	%ΔReturn Co-Movement
High %ΔTickers	877	0.0445
Low %ΔTickers	724	–0.0737
Difference		0.1182***
T-statistic		(3.75)

Panel C: Placebo test

	%ΔReturn Co-Movement			
%ΔTickers (Random)	–0.0054	–0.0046	–0.0045	–0.0034
	(–0.25)	(–0.21)	(–0.20)	(–0.16)
%ΔVolume	0.0547	0.0748**	0.0722**	0.1086***
	(1.30)	(2.23)	(2.10)	(3.09)
%ΔSpread	–0.1574***	–0.1489***	–0.1507***	–0.0454
	(–3.04)	(–3.05)	(–3.19)	(–1.36)
Return	–0.0996	–0.0888	–0.0803	–0.0960
	(–1.13)	(–1.06)	(–0.87)	(–1.02)
%ΔIndustry Beta		0.0011	0.0012	0.0045
		(0.04)	(0.04)	(0.16)
%ΔH-Index			–0.0139	–0.0268
			(–0.32)	(–0.59)
%ΔVolatility				–0.4259***
				(–3.46)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,584	1,550	1,550	1,550
R-squared	0.6321	0.6391	0.6392	0.6439

Table 11: Robustness of Return Co-Movement

Description: A modification of equation (7) examines the impact of ticker subscriptions in a state on the local betas of firms headquartered in the state. This impact is captured by the interaction variable involving State Return and %ΔTickers. Panel A reports the results of this modification using weekly firm-level observations, while Panel B reports the results from a difference-in-difference methodology using annual state-level observations. Panel C reports the results from a placebo test that re-estimates equation (9) after randomizing the state-year %ΔTickers observations. Standard errors are double-clustered by state and year. T-statistics are reported in parentheses below each coefficient with ***, **, * representing significance at the 1%, 5%, and 10% level, respectively.
Interpretation: The results confirm that an increase in ticker subscriptions in a state is associated with greater return co-movement (higher average return cross-correlation) among firms headquartered in the same state.

Panel A: Ticker subscriptions

	%ΔTickers
ΔDatacost	−0.4704***
	(−4.41)
State Fixed Effects	Yes
Observations	180
R-squared	0.0783

Panel B: Return continuation

	Return					
ΔDatacost	0.0000	−0.0001	−0.0001	−0.0001	−0.0001	−0.0001
	(0.16)	(−0.79)	(−0.79)	(−0.58)	(−0.66)	(−0.67)
Lag Return	−0.0283**	−0.0021	−0.0020	0.0051	0.0052	0.0052
	(−2.50)	(−0.28)	(−0.28)	(0.71)	(0.72)	(0.72)
Lag Return × ΔDatacost	−0.1227***	−0.0552***	−0.0553***	−0.0585***	−0.0583***	−0.0583***
	(−6.63)	(−4.62)	(−4.62)	(−4.72)	(−4.66)	(−4.66)
%ΔVolume		0.0015***	0.0015***	0.0021***	0.0020***	0.0020***
		(7.18)	(8.05)	(8.05)	(7.93)	(7.93)
%ΔVolume × ΔDatacost			−0.0001	−0.0002	−0.0002	−0.0002
			(−0.46)	(−0.68)	(−0.74)	(−0.74)
%ΔSpread				−0.0003	−0.0002	−0.0002
				(−0.83)	(−0.73)	(−0.73)
%ΔListings					−0.0006	−0.0006
					(−1.01)	(−1.04)
%ΔPopulation						−0.0020
						(−0.84)
Observations	4,665,124	4,089,909	4,089,909	3,524,136	3,498,736	3,498,736
R-squared	0.0184	0.0071	0.0071	0.0083	0.0082	0.0082

Panel C: Return co-movement

	%ΔReturn Co-Movement			
ΔDatacost	–0.1045**	–0.1039**	–0.0982**	–0.0876**
	(–2.63)	(–2.59)	(–2.63)	(–2.63)
%ΔVolume	–0.1484	–0.1467	–0.1558	–0.0817
	(–0.76)	(–0.74)	(–0.75)	(–0.46)
%ΔSpread	0.3870*	0.3736	0.3433	0.9027**
	(2.25)	(1.98)	(1.70)	(3.62)
Return	–0.0822	–0.0818	–0.0490	–0.0225
	(–0.52)	(–0.52)	(–0.32)	(–0.14)
%ΔIndustry Beta		–0.0156	–0.0127	–0.0250
		(–0.21)	(–0.17)	(–0.37)
%ΔH-Index			–0.0251	–0.0208
			(–0.90)	(–0.91)
%ΔVolatility				–0.9806***
				(–4.13)
Observations	180	180	180	180
R-squared	0.9269	0.9270	0.9278	0.9354

Panel D: Instrumental variable estimation

	First Stage %ΔTickers	Second Stage ΔAutocorrelation
Predicted %ΔTickers		0.2114**
		(2.31)
ΔDatacost	–0.5000***	
	(–2.78)	
%ΔVolume	–0.0026	0.0266***
	(–0.05)	(3.95)
%ΔSpread	0.0867	–0.0176
	(1.44)	(–1.39)
Return	0.1378**	–0.0114
	(2.35)	(–0.91)
%ΔListings	0.0401	–0.0323
	(0.17)	(–0.51)
%ΔPopulation	–2.2415*	0.3674
	(–1.97)	(1.21)
State Fixed Effects	Yes	Yes
Observations	180	180
Number of States	6	6
R-squared	0.0627	0.0368

Table 12: Data Transmission Costs

Description: Panel A of this table reports the relation between state-level ticker subscriptions and data transmission costs from 1952-1981 for six states (California, Illinois, Pennsylvania, Michigan, Massachusetts, and Texas). With ΔDatacost replacing $\%\Delta$Tickers, Panel B reports on the relation between data transmission costs and return continuation in equation (4). Panel C reports on the relation between data transmission costs and co-movement in equation (9). ΔDatacost equals $+1$ and -1, respectively, for positive and negative changes in the cost of transmitting data to a state from the prior year, and is 0 for no change. Standard errors are double-clustered according to the fixed effects in each specification. Panel D reports the results from an instrumental variable analysis whose first stage and second stage are in equation (11) and equation (12), respectively. Annual state-level observations are used in Panels A, C, and D, while daily firm-level observations are used in Panel B. ***, **, * represent significance at the 1%, 5%, and 10% level, respectively.
Interpretation: Lower data transmission costs to a state are associated with a subsequent increase in ticker subscriptions in the state. Furthermore, lower data transmission costs to a state are associated with greater return continuation and return co-movement for the firms headquartered in the state.