Insider Trading and Shareholder Investment Horizons

Xudong Fu
Department of Finance
University of Louisville
xudong.fu@louisville.edu

Tian Tang
Department of Finance
University of Louisville
lori.tang@louisville.edu

Lei Kong
Department of Economics, Finance and Legal Studies
University of Alabama
lkong@cba.ua.edu

Xinyan Yan
Department of Economics and Finance
University of Dayton
xyan02@udayton.edu

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Abstract

This paper examines the effect of shareholder investment horizons on insider trading. We find that insiders of firms with more short-term investors (long-term investors) earn higher (lower) profits from insider trading and are more (less) likely to engage in informed trades persistently. We provide further evidence showing that insiders use more strategic trading patterns to exploit their informational advantages when shareholder investment horizons are shorter. These findings are consistent with the notion that shorter shareholder investment horizons aggravate the information asymmetry between insiders and outsiders. Employing the actual Russell 1000/2000 index switches as a source of exogenous variations in shareholder investment horizons, we show a casual effect of shareholder investment horizons on insider trading.

I. Introduction

Over the past several decades, institutional ownership of U.S. firms has increased dramatically. [1] However, institutional investors are far from homogeneous. One important dimension along which they differ is their investment horizons. Existing literature has shown that shareholder investment horizons affect various corporate policies (Gasper, Massa, and Matos, 2005; Chen, Harford, and Li, 2007; Gasper, Massa, Matos, Ratgiri, and Rehman, 2013; Derrien, Kecskes, and Thesmar, 2013; Hao, 2014; Jang and Lee, 2017; Harford, Kecskes, and Mansi, 2018). However, relatively few studies have examined the role of shareholder investment horizons on the trading profits and behaviors of corporate insiders, a special group of shareholders usually possessing access to private information of their companies (John and Mishra, 1990; John and Lang, 1991; Zhang, 2001; and Chau and Vayanos, 2008; Piotroski and Roulstone, 2005). The objective of this paper is to fill this gap by studying, for the first time, the relationship between shareholder investment horizons and insider trading.

There are at least two reasons why shareholder investment horizons may affect insider trading. First, short shareholder investment horizons can aggravate the degree of information asymmetry of a firm, which increases insiders' informational advantages. Prior literature provides evidence suggesting that short-term investors tend to pressure management to achieve short-run earnings target. Their short-run speculative motives incentivize management to pursue short-termism goals by conducting managerial misbehaviors, which intensify the information asymmetry of a firm (Harford, Kecskes, and Mansi, 2018; Graham, Li, and Qiu, 2008). Moreover, the existing literature shows that long-term institutions, who focus more on the long-run value and the viability of the financial markets, have more incentives and higher efficiency to mitigate information asymmetry (Boone and White, 2015). Since the profits of insider trades stem from

[1] According to Blume and Keim (2017) and Chen, Harford, and Li (2007), institutions owned approximately 7% of US equities in 1950, 51% at the end of 2004 , and 67% by 2010.

insiders' informational advantages (Aboody and Lev, 2000; Frankel and Li, 2004; Huddart and Ke, 2007), the presence of more short-term investors could lead to more informed trades and higher insider trading profits. Moreover, higher information asymmetry can also give insiders longer-lived informational advantages. As a result, corporate insiders can exploit their informational advantages by trading over longer periods of time and are able to obtain persistent trading profits (Kyle, 1985; Biggerstaff, Cicero, and Wintoki, 2017; Cline, Gokkaya, and Liu, 2017).

Second, short-term institutions could be information competitors to corporate insiders, hence reduce insiders' informational advantages. The existing literature shows that short-term institutions are better informed than long-term institutions (Yan and Zhang, 2009) and can even decipher and mimic informative insider trades (Cohen, Malloy, and Pomorski, 2012), which could impose competition pressure on insiders. Since insiders' informational advantages determine their trading profits (Kyle, 1985), insiders in firms with more short-term institutions could suffer from a profit reduction. Moreover, this competition effect can make the informational advantages of insiders shorter-lived. Aware of such competition from short-term institutions, insiders may accelerate their information processing and use different trading strategies to preempt short-term institutions (Massa, Qian, Xu, and Zhang, 2015).

Using the shareholder investment turnover ratio developed by Gaspar, Massa, and Matos (2005) and the firm-level investor duration developed by Cremers and Pareek (2015) to measure shareholder investment horizons, we first examine the effect of shareholder investment horizons on the trading profitability of insiders. In particular, we find that the 3-, 6-, and 12-month profitability after insider trading are negatively correlated with shareholder investment horizons. In addition, we examine the profit persistence of insider trading in firms with different shareholder

investment horizons. Inspired by Cline, Gokkaya, and Liu (2017), we construct an indicator to measure the persistence of positive abnormal returns over time from insider trading and find that insiders in firms with shorter shareholder investment horizons are more likely to have persistent profits. These results suggest that insider trading in firms with shorter investor horizons is more informative and yield more persistent profits, consistent with the notion that insiders in firms with shorter investor horizons have more informational advantages due to aggravated information asymmetry caused by short-term institutions.

Next, we examine the impact of shareholder investment horizons on the trading patterns of insiders, which can also shed light on the potential channels through which insiders increase their trading profitability in the presence of more short-term investors. We study three trading patterns that insiders use to exploit their informational advantages. First, to examine whether insiders in firms with shorter shareholder investment horizons engage in more informed trades, we classify insider trades as routine trades or opportunistic trades following the methodology of Cohen, Malloy, and Pomorski (2012). We show that investor horizons are negatively correlated with the density of opportunistic insider trades. In other words, insiders in firms with more short-term institutional investors engage in more opportunistic trades, which are more informed (Cohen, Malloy, and Pomoski, 2012). Second, to examine whether insiders in firms with shorter shareholder investment horizons realize profits more by switching trading directions, we employ the insider trading horizon measure developed by Akbas, Jiang, and Koch (2018). Consistent with the notion that insiders in firms with shorter shareholder investment horizons engage in more informed trades, we find that insiders in firms with shorter investment horizons realize their trading profits more by frequently switching trading directions over different years. Third, to examine whether the informational advantages of insiders in firms with shorter shareholder investment

horizons are long-lived (due to higher information asymmetry) or short-lived (due to information competition), we classify insider trades as isolated trades or sequenced trades following Biggerstaff, Cicero, and Wintoki (2017).[2] We find that insiders of firms with shorter shareholder investment horizons tend to strategically plan and use sequenced trades over consecutive months to maximize profits. This indicates that insiders in firms with shorter shareholder investment horizons are more likely to have long-lived informational advantages. Overall, these trading pattern results are consistent with the notion that information asymmetry induced by more short-term institutions is the dominant factor: shorter investor horizons aggravate the degree of information asymmetry between insiders and outsiders, which results in more informed trades and longer-lived informational advantages of insiders.

However, it is an empirical challenge to address the potential endogeneity issues and pin down the causal relation due to omitted variables and simultaneity. To address these endogeneity problems, we exploit the Russell 1000/2000 annual index reconstitution and apply index switches as instrumental variables (Schmidt and Fahlenbrach, 2017; Fich, Harford, and Tran, 2015) for shareholder investment horizons. Inspired by the recent literature that uses Russell index reconstitution as a random shock to the level of total institutional ownership (Appel, Gormley, and Keim, 2016; Crane, Michenaud, and Weston, 2016; Boone and White, 2015), we instead exploit the index switches between the Russell 1000 Index and the Russell 2000 Index as a source of exogenous variations in institutional investment horizons. This approach, which alleviates important endogeneity concerns, helps study the causal relation between shareholder investment horizons and insider trading. After controlling for the possible endogeneity problems, our main

[2] Biggerstaff, Cicero, and Wintoki (2017) find that insiders tend to trade in sequences when they have long-lived information advantages and information environment is less transparent.

findings continue to hold. The results in this paper are also robust to the use of alternative measures (Yan and Zhang, 2009) of shareholder investment horizons. Lastly, this paper shows that shareholder investment horizons reduce both insider trading profits from sales and insider trading profits from purchases.

Our paper contributes to the literature in several ways. First, we contribute to the growing shareholder investment horizon literature by showing that the heterogeneity of shareholder investment horizons has an impact on the trading behaviors of corporate insiders. We use turnover ratio to measure institutions' general holding horizons and duration to measure the specific institution-firm level horizons. We show that shareholder investment horizons are negatively related to insider trading profitability. These findings are also related to the broader literature on short-termism as they show another perspective of its consequences: by exacerbating firms' information asymmetry, short-term investors enhance insiders' informational advantages and trading profits.

Second, by analyzing the trading patterns proposed by Biggerstaff, Cicero, and Wintoki (2017) and Cohen, Malloy, and Ponorski (2012), we find that short-term shareholders increase the density of sequenced trades and opportunistic trades. We also expand the insider trading literature by connecting insider trading horizons (Akbas, Jiang, and Koch, 2018) with shareholder investment horizons. We find that corporate insiders match their trading horizon with the investor horizons of their firms. These findings suggest that insiders materially change their trading strategies to exploit their informational advantages in an exacerbated information environment induced by shorter shareholder investment horizons.

Lastly, our paper uses a random shock from the annual Russell index reconstitution to identify exogenous variations in shareholder investment horizons. Armed with this, we are able to

assuage the concerns of endogeneity and address the potential endogeneity on the relationship between shareholder investment horizons and insider trading activities.

The rest of the paper is organized as follows: Section II reviews related literature and states our hypothesis. Section III discusses the sample selection, key variable constructions, and summary statistics. Section IV presents the baseline results, while Section V shows robustness checks. Section VI concludes.

II. Literature Review and Hypothesis Development

In this section, we explore the motivation for our empirical analysis of the relation between insider trading and shareholder investment horizons by reviewing the related literature and discussing the development of our hypotheses.

It has long been recognized that insiders can trade on private information and hence earn abnormal returns on their trades (Lories and Niederhoffer, 1968; Jaffe, 1974). Many studies have shown positive abnormal returns of insider trades prior to the announcements of significant events (Karpoff and Lee, 1991; Argrawal and Cooper, 2015; Ravina and Sapienza, 2010). Insider trades also reveal superior information about the firm's future cash flows (Ke, Huddart, and Petroni, 2003; Piotroski and Roulstone, 2005). Moreover, insiders can be contrarian investors (Ben-David and Roulstone, 2010) who profit from stock mispricing (Ali, Wei, and Zhou, 2011). The profits earned by insiders' trades also reflect their superior ability to be attentive to public information (Alldredge and Cicero, 2015). All of these findings suggest that profits from insider trades stem from their informational advantages. In the following, we discuss how shareholder investment horizons may enhance or erode the informational advantages of insiders.

On the one hand, shorter investment horizons may enhance the informational advantages of insiders. First, investors with shorter investment horizons tend to focus on short-term profits (Gaspar, Massa, Matos, Patgiri and Rehman, 2013) and pressure management to achieve short-run earnings target, which may be at the cost of long-run value creation. Their short-run speculation-oriented goals incentivize management to pursue short-term goals by conducting managerial misbehaviors, such as earnings management and financial frauds, which increase the degree of information asymmetry of a firm (Harford, Kecskes, and Mansi, 2018; Graham, Li, and Qiu, 2008). Second, investors with longer investment horizons focus on the long-run value creation (Harford, Kecskes, and Mansi; 2018), so they might prefer a more transparent information environment with less insider trading profits. Attig, Cleary, El Ghoul, and Guedhami (2012) argue that institutional investors with longer shareholder investment horizons have greater incentives and higher efficiency to mitigate asymmetric information and agency problems. A recent paper by Harford, Kecskes, and Mansi (2018) finds that long-term investors strengthen governance and restrain managerial misbehaviors. As a result, the degree of information asymmetry decreases as the shareholder investment horizons increase. Coupled with the notion that insiders' informational advantages increase with information asymmetry (Aboody and Lev, 2000; Frnakel and Li, 2004), we hypothesize that shorter investment horizons could enhance the informational advantages of insiders. This is our information asymmetry hypothesis.

On the other hand, the presence of short-term institutional investors may also erode the informational advantages of insiders due to the information competition between insiders and short-term institutional investors. Yan and Zhang (2009) show that trades by short-term institutions contain more information than those by long-term institutions, which suggest that short-term institutions can be information competitors to corporate insiders by reducing the comparable

informational advantages insiders possess over the markets. Holden and Subrahmanyam (1992) suggest that the information competition between insiders and short-term investors reduces the profitability of insider trades. Cohen, Malloy, and Pomorski (2012) further show that another way for short-term investors to be insiders' information competitors is to mimic insiders' informative trades, which reduces insiders' profits. As a result, we hypothesize shorter shareholder investment horizons could erode the informational advantages of insiders. This is our information competition hypothesis.

Based on the above hypotheses, we develop the following three sets of testable implications.

A. Shareholder investment horizons and insider trading profitability.

In his seminal paper, Kyle (1985) shows that insiders' profits from trades increase in insiders' informational advantages. If the information asymmetry hypothesis prevails, we expect insiders in firms with shorter shareholder investment horizons to have higher and more persistent trading profitability. On the contrary, Holden and Subrahmanyam (1992) argue that the information competition between insiders and short-term investors reduces the profitability of insider trades. If the information competition hypothesis prevails, we expect insiders in firms with shorter investment horizons to have lower trading profits and a lower likelihood of persistent profits.

B. Shareholder investment horizons and the density of informed trades

Since Cohen, Malloy, and Pomorski (2012) show that opportunistic trades predict future stock returns as opposed to routine trades, we use the opportunistic (routine) trades as our first measure of informed (uninformed) trades. Akbas, Jiang, and Koch (2018) study the information

content from the frequency of insider trading switches between buying and selling across different years, which they refer to as the insider trading horizon. As they define, insiders with longer (shorter) trading horizon change their trading direction less (more) frequently over the years. They find that insider trading horizon is negatively associated with the insider trading informativeness. Therefore, we use insider trading horizon as our second measure of informed trades.

When insiders have more informational advantages, they tend to engage in more informed trades to exploit these advantages. When insiders face competition from other informed traders such as short-term institutions, they tend to engage in less informed trades because private information is more rapidly revealed (Holden and Subrahmanyam, 1992).

Therefore, the information asymmetry hypothesis implies that insiders in firms with shorter investment horizons engage in more informed trades. In other words, we expect that insiders in firms with shorter investment horizons to have a higher density of opportunistic trades and have a shorter insider trading horizon The information competition hypothesis, on the other hand, implies that insiders in firms with shorter investment horizons engage in less informed trades. In other words, we expect that insiders in firms with shorter investment horizons to have a lower density of opportunistic trades and have a longer insider trading horizon.

C. Shareholder investment horizons and sequenced trades

Kyle (1985) shows that informed traders gradually release their information to the market through trading. A recent study by Biggerstaff, Cicero, and Wintoki (2017) finds that when insiders have long-lived informational advantages they intend to time the information disclosures and trade in sequences over a number of months. Since a higher degree of information asymmetry give

insiders a longer-lived informational advantage, if the information asymmetry hypothesis prevails, we expect that insiders in firms with shorter shareholder investment horizons are more likely to use sequenced trades to exploit their informational advantages. In contrast, the competition from short-term institutions makes the informational advantages of insiders shorter-lived. Insiders would trade rapidly in the hope of beating short-term investors in information exploration (Holden and Subrahmanyam, 1992). This notion of faster trading to preempt the potential competition is also echoed by Massa, Qian, Xu, and Zhang (2015). Hence, if the information competition hypothesis prevails, we expect that insiders in firms with shorter shareholder investment horizons are less likely to use sequenced trades.

In summary, if the information asymmetry hypothesis prevails, we expect insiders in firms with shorter shareholder investment horizons to have higher trading profitability, more persistent profits, a higher density of opportunistic trades, shorter investment horizons, and more sequenced trades. If the information competition hypothesis prevails, we expect insiders in firms with shorter shareholder investment horizons to have lower trading profitability, less persistent profits, a lower density of opportunistic trades, longer investment horizons, and less sequenced trades.

III. Sample Construction, Key Variables, and Summary Statistics

A. Sample Construction

To examine the effect of institutional investment horizons on insider trading, we obtain data from several sources. We first obtain insider trading information for the period from 1986 to 2016 from Thomson-Reuters Financial Insider Filing Data (TFN). Following the existing literature (Cohen, Malloy, and Pomorski, 2012; Cline, Gokkaya, and Liu, 2017), we focus on Form 4 open

market transactions and eliminate all other types of trades, such as option exercises and private transactions. We also exclude trades with less than 100 shares and with a transaction price less than $2.00 to avoid penny stock bias. Using trade level data, we construct insider trading profitability variables and other variables of informative trading patterns at the firm level. We then merge our insider transaction data with the Thomson-Reuters 13F institutional holding database, which provides quarterly shareholder ownership information by institutional managers with $100 million or more in assets under management. We obtain financial statement data from Compustat and stock return data from CRSP. Though our main sample includes 68,488 firm-year observations, the sample size varies across regressions due to data availability.[3] In our robustness tests for endogeneity concerns, we obtain the historical Russell 1000 and 2000 Index constituents from FTSE Russell.

B. Insider Trading Profitability Variables

We construct firm-level variables to measure insider trading profitability. We begin with calculating the trade level profitability. For every insider trade, we compute characteristic-adjusted post-trade abnormal stock return (Daniel, Grinblatt, Titman, and Wermers, 1997) over 3, 6, and 12 months (Cohen and Lou, 2012) respectively, starting from the month after the transaction month. If the trade is an insider purchase, its profitability is defined as the compounded buy-and-hold raw stock return minus the value-weighted return of the matching portfolio; if it is an insider sale, the profitability is defined as the value-weighted return of the matching portfolio minus the buy-and-

[3] For example, profitability and sequenced trades are measured over one year, so the ends of the time period for these two test samples are 2016; however, because insider trading horizon, routine trade percentage, and profitability persistence are measured over multiple years, the ends of time period for these test samples are truncated at earlier dates.

hold raw return. For matching portfolio returns, we construct 100 characteristic-sorted monthly matching portfolios (10 × 10) based on firm size and book-to-market ratio following the spirit of Fama and French (1993).[4] To obtain the firm level insider trading profitability, we calculate the weighted-average profitability of all insider trades in a firm during a calendar year (t+1), using the number of shares traded by insiders as the weight. This process generates firm average insider trading profitability measures over 3 months, 6 months, and 12 months.

We also study whether shareholder investment horizons are related to the persistence of insider trade profitability (Cline, Gokkaya, and Liu, 2017). Following Cline, Gokkaya, and Liu (2017), we use a three-year window to determine the persistence of insider trade profitability. However, while they use the individual level of abnormal insider trade returns, we focus on the returns at the firm level; we construct a dummy variable that is one if a firm shows positive average insider trading profitability, measured by 6-month post-transaction abnormal returns, for three consecutive years from t+1 to t+3, and is equal to zero otherwise.

C. Insider Trading Patterns

The next three types of insider trading related variables are tied to the recent literature that focuses on insiders' trading patterns and strategies to exploit their informational advantages.

First, to capture routine trade pattern (Cohen, Malloy, and Pomorski, 2012), we only include insiders who have traded at least three years in a row so that we would be able to distinguish their routine trades, which occur in the same month for at least three years in a row, and their opportunistic trades, which are everything else. This method helps us identify the percentage of

[4] Marching portfolio breakpoints and returns are from Ken French's data library at the Dartmouth.

routine trades for an insider from year t+1 to year t+3. We then average these individual numbers, bounded between 0 to 1, into a percentage number of routine trades within a firm from year t+1 to year t+3, using the number of traded shares as the weight. It is worth mentioning that because we restrict our sample to individuals who have had insider trades for a minimum of three consecutive years, the number of non-missing observations for this variable is smaller than other insider trading informativeness related variables.

Second, following the methodology by Akbas, Jiang, and Koch (2018), we compute the average annual net insider order flow ($HOR_{d,f,t+1}$) at the individual-year level as follows:

$$HOR_{d,f,t+1} = \left| \frac{\sum_{y=t+1}^{y=t+5} IOF_{d,f,y}}{N} \right| * (-1) \quad (1)$$

where $IOF_{d,f,y}$ is calculated as the number of shares purchased minus the number of shares sold, divided by the total number of shares purchased and sold by insider d in firm f during calendar year y. N is the number of calendar years the insider trades in the five year period. If an insider only makes purchases (sales), $IOF_{d,f,y}$ would always be +1 (-1), and $HOR_{d,f,t+1}$ would be -1 after the absolute function and the multiplication of -1, which suggests a slower turnover and longer insider trading horizon. On the contrary, if an insider keeps flipping and her purchases exactly offset her sales, $IOF_{d,f,y}$ and $HOR_{d,f,t+1}$ would both be 0, suggesting a faster turnover and shorter insider trading horizon. We then use all individual $HOR_{d,f,t+1}$ in one firm to obtain the weighted-averaged $HOR_{f,t+1}$ at the firm-year level, which essentially is an index between -1 and 0. While Akbas, Jiang, and Koch (2018) use a ten-year period to calculate insider trading horizon, we use five year trading data in calculating our primary measure of insider trading horizon so that we can preserve more observations in our regression tests while still maintaining the spirit of this measure

as a methodology to capture insider flipping frequency. At the same time, we also construct the ten-year insider trading horizon for robustness reasons.

Third, we construct the sequenced pattern measure by aggregating insider trades to the insider-month-direction (buy or sell) level, as suggested by Biggerstaff, Cicero, and Wintoki (2017). Next, we identify a trade month as sequenced if the insider trades in the same direction in multiple consecutive months, allowing for one-month gap. For instance, if an insider sells company stocks in March, April, June, and September, and buys companies stocks in May, we identify the sales in March, April, and June as sequenced trades, and identify the buys in May and the sales in September as isolate trades.[5] For each insider, we calculate her sequenced trade percentage in a calendar year using the number of shares as the weight, before weighted-averaging individual sequenced trade percentages into a firm-level average sequenced trade percentage.

D. Shareholder Investment Horizons Measures and Empirical Design

The key independent variables in this paper measure the average length of time shareholders stay with a firm, calculated from institutional holding data. We follow Gaspar, Massa, and Matos (2005) to construct shareholder turnover ratio variables, and follow Cremers and Pareek (2015) to construct duration variables.

Specifically, for turnover ratios, we first calculate institutional investor i's aggregate purchases at quarter q *(ChurnRate_buy* $_{i,q}$ *)* using Eq. (2) and i's aggregate sales at quarter q *(ChurnRate_sell* $_{i,q}$ *)* using Eq. (3) as follows:

[5] This example is for illustration only. In reality, insiders are less likely to engage in trades with opposite directions in consecutive months due to the "Short-Swing Profit Rule", which requires insiders to return any profits made from the purchase and sale of company stock if both transaction occur within a six-month period.

$$ChurnRate\_buy_{i,q} = \sum_{k=1}^{N_K} \left| \left(S_{k,i,q} P_{k,q} - S_{k,i,q-1} P_{k,q-1} - S_{k,i,q-1} \Delta P_{k,q} \right) \right|$$

$$if \ S_{k,i,q} P_{k,q} > S_{k,i,q-1} P_{k,q-1} \qquad (2)$$

$$ChurnRate\_sell_{i,q} = \sum_{k=1}^{N_K} \left| \left(S_{k,i,q} P_{k,q} - S_{k,i,q-1} P_{k,q-1} - S_{k,i,q-1} \Delta P_{k,q} \right) \right|$$

$$if \ S_{k,i,q} P_{k,q} \leq S_{k,i,q-1} P_{k,q-1} \qquad (3)$$

where $S_{k,i,q}$ and $S_{k,i,q-1}$ are the numbers of shares of stock k held by institutional investor i at quarters q and q-1. $P_{k,q}$ and $P_{k,q-1}$ represent the prices of stock k at the end of quarters q and q-1, adjusted for stock splits and dividend payments. N_k is the number of firms held by institutional investor i at quarter q. The churn rate of investor i at quarter q is

$$ChurnRate1_{i.q} = \frac{(ChurnRate\_buy_{i,q} + ChurnRate\_sell_{i,q})}{\sum_{k=1}^{N_k} \frac{(S_{k,i,q} P_{k,q} + S_{k,i,q-1} P_{k,q-1})}{2}} \qquad (4)$$

$ChurnRate1_{i,q}$ measures the frequency with which each institutional investor rotates stock positions in her portfolio. A short-term investor trades her positions in the portfolio more frequently than a long-term investor. To smooth out the extreme values in one quarter and possible seasonality, we take the average churn rate of each institutional investor over the past four quarters (q-3, q). We then calculate the weighted average churn rate of all institutional investors in firm k for quarter q. In Eq. (5), J_i is the total number of institutional investors reporting holdings in firm k in quarter q, and $w_{k,i,q}$ is the weight of institutional investor i's holdings in firm k at quarter q.

$$Institutional\ investor\ turnover\ of\ firm\ f\ (Turnover) =$$

$$\sum_{i=1}^{J_i} w_{f,i,q} \left\langle \frac{1}{4} \sum_{r=0}^{3} ChurnRate1_{i,q-r} \right\rangle \qquad (5)$$

This measure, *Turnover*, shows the investment horizon of institutional investors in the firm-quarter. Because this firm-level turnover measure is inversely related to the average shareholder investment horizon, firms with higher (lower) institutional investor turnover are firms with more short- (long-) term shareholders. To provide robustness to our results, we also construct a set of alternative measures of shareholder investment horizons to measure the effects of short-term and long-term investors on insider trading informativeness. Specifically, based upon the churn rate of institutions in eq. (3), we define short-term (mid-term/long-term) institutional investors as the investors that have an average churn rate in the top (middle/bottom) tercile. We then calculate the percentages of firms' ownerships held by short-term (*Short-term ownership by turnover*), mid-term (*Mid-term ownership by turnover*) and long-term (*Long-term ownership by turnover*) investors (Yan and Zhang, 2009; Gaspar, Massa, Matos, Patgiri, and Rehman, 2013).

Nevertheless, *Turnover ratio* is an institutional level characteristic as its measures are calculated from the average turnover ratio from an institution's all equity holdings. A long-term institution can turn over its position in one particular company's stocks very quickly while maintaining long-term positions in many other companies. In such case, the long-term institution, defined by its small turnover ratio on average, might spend little resources in monitoring that company, or even engage in short-term trading which could affect stock market efficiency. It is therefore potentially important to analyze the specific holding relationships between institutions and a firm, measured by the time these institutions have actually held the firm's stocks. The stock holding duration of institutional investors (Cremers and Pareek, 2015) provides a measure to control for the specific firm-institution horizon. We employ *Duration* in this paper to account for the situations that an institution could be short-term in some firms and long-term in other firms.

Following Cremers, Pareek, and Sautner (2017), we construct *Duration* in two steps. First, we calculate the firm-institution level duration to measure the time length in quarters an institution has invested in the firm, as shown in Eq. (6).

$$Firm - Inst.Duration_{k,i,q} = d_{k,i,q} = \sum_{t=q-W}^{q} \left[\frac{(q-t)\alpha_{k,i,t}}{H_{k,i} + B_{k,i}} \right] + \frac{W * H_{k,i}}{H_{k,i} + B_{k,i}} \qquad (6)$$

where $B_{k,i}$ is the percentage of shares of stock k bought by institution i between t = q – W and t = q (t, q are in quarters). $H_{k,i}$ indicates the percentage of shares outstanding of stock k hold by institution i at time t = q – W. $\alpha_{k,i,t}$ is the percentage of stock k bought or sold by institution i between time t-1 and t, where it is positive for buys and negative for sells. Consistent with Cremers, Pareek, and Sautner (2017), we set the W to be 20 quarters since very few stocks are held continuously for longer than five years.

In the second stop, we compute *Duration* at the firm level by averaging *Firm-Inst. Duration* across all institutions that hold that firm's stocks in quarter t, using each institution's holding as weights. Additionally, we also construct a set of alternative measures to measure the effects of short-term and long-term investors in terms of duration. Specifically, we sort all *Firm-Inst. Duration* in quarter t and define short-term (mid-term/long-term) institution-firm duration as the institution-firm observations that have a *Firm-Inst. Duration* in the bottom (middle/top) tercile. We then calculate the percentages of a firm' ownerships held by institutions of short-term (*Short-term ownership by duration*), mid-term (*Mid-term ownership by duration*) and long-term (*Long-term ownership by duration*) institution-firm duration for each firm.

In our paper, we match quarter four institutional investor horizon measures in year t, which are the trailing averages over four quarters in year t for turnover ratio and calculated over the last

twenty quarters for duration, with firm level insider trading measures in year t+1[6] to obtain a firm-year sample, supplemented by stock and accounting data in year t. The test model in eq. (7) helps us investigate the influence of shareholder investment horizon on various measures of insider trading informativeness.

$$\textit{Informativeness measure}_{i,t+1} = \alpha + \beta\,(\textit{Shareholder investment horizon variable}_{i,t}) + \Upsilon\,(\textit{Control variables}_{i,t}) + \textit{Year dummies} + \textit{Industry dummies} + \varepsilon_{i,t} \quad (7)$$

The dependent variable is one of the following five types of firm level measures: 1) the post-transaction profitability for all insider trades in year t+1, calculated over 3 months, 6 months, or 12 months after the transaction month; 2) the persistence of positive firm-level insider trading profitability from years t+1 to t+3; 3) the percentage of routine trades from years t+1 to t+3; 4)the insider trading horizon, calculated using insider trading data from years t+1 to t+5; and 5) the percentage of sequenced trades in year t+1;. We estimate the effect of shareholder investment horizons on the persistence of profitability with Probit model for its dichotomous nature. Since insider trading horizon is left-censored at -1 and right-censored at 0, whereas both the percentage of sequenced trades and the percentage of routine trades are left-censored at 0 and right-censored at 1, we use Tobit model for these three tests. For shareholder investment horizon variables, our primary measures alternate between firm level turnover ratio and duration, with both measures supplemented by ownership by short-term investors or long-term investors to provide a more complete picture. Following the literature on insider trading informativeness, we include book-to-market ratio, firm size, stock turnover, and idiosyncratic volatility as control variables. We also

[6] Because the primary insider trading horizon in our paper is measured over five years, we use insider trading horizon from years t+1 to t+5; routine trade percentage and profitability persistence are measured over three years, so these two measures from years t+1 to t+3.

include total institutional ownership as another control variable since our investment horizon measures are derived from the ownership by institutions.

E. Summary Statistics

(Insert Table 1 Here)

Table 1 shows the summary statistics of the full sample. As stated above, we have 68,488 firm-year observations in the sample which spans from 1986 to 2016 for insider trading data. The average firm level insider trading profitability over a 3-month (6-month/12-month) period is 1.8735% (2.2168%/2.5025%), consistent with the findings in the existing insider trading literature that insider trades are informative. 12.57% of the firms capture positive insider trading profitability for three years in a row. In line with Akbas, Jiang, and Koch (2018), insiders tend not to flip their trading direction frequently, as the mean (median) insider trading horizon over five years is -0.9131 (-0.9533). 19.95% of the trades are sequenced trades, whereas 20.98% of them are routine trades. The average *Turnover ratio*, a weighted average of churn rates across all institutional investors for a given company, is 0.1945. The mean (median) *Duration* is 5.9476 (5.8828) quarters, in line with 1.30 (1.29) years reported by Cremers, Pareek, and Sautner (2017). In addition, the correlation coefficient between *Duration* and *Turnover ratio* equals -0.3462 in our sample, suggesting that while these two variables are related, they still possess distinctive information (Cremers, Pareek, and Sautner, 2017). Institutional owners on average hold 49.22% of the total shares outstanding in our sample, underscoring the importance of focusing on institutional owners for general shareholder analysis. The decomposition of total institutional ownership by different horizons shows that the institutional ownership of short-term (long-term) investors by turnover ratio is 14.80% (13.28%), while the institutional ownership of short-term (long-term) investors by

duration is 12.89% (1984%). *Stock turnover* is the average daily stock volume divided by the number of shares outstanding during a calendar year, and it shows that on average 0.70% of the shares are traded each day. *Idiosyncratic volatility* is the annualized standard deviation of the residuals from regressing the difference between daily stock returns and the risk free rate on the daily Fama-French three factors during a calendar year. To minimize the possible effects of outliers in our regressions, all non-binary variables are winsorized at the 1st and 99th percentiles.

IV. Results

A. Insider Trading Profitability

We begin with analyzing the effects of shareholder investment horizons on insider trading profitability. We use OLS regressions with standard errors clustered at the firm level and include year and industry fixed effects[7]. Following the prior literature, we use characteristic adjusted post-trade abnormal stock return over 3 months, 6 months, and 12 months to directly measure the profitability of insider trading (Daniel, Grinblatt, Titman, and Wermers, 1997; Cline, Gokkaya, and Liu, 2017; Cohen and Lou, 2012). To measure shareholder investment horizons and provide robustness and thoroughness, we use two sets of main independent variables: 1) *Turnover ratio*, which is the weighted average churn rate of all institutional investors in a firm-year, and *Short-* or *Long-term ownership by turnover*, which is the percentage of shares held by short- or long-term institutional investors in a firm-year; and 2) *Duration*, which is the weighted average holding duration of all institutions, and Short- or Long-term ownership defined by *Duration*. Prior literature indicates that the institutional investors reduce insider trading informativeness, so we

[7] We use two digit SIC for the industry fixed effects throughout the paper.

control the level of total institutional ownership. Following prior studies (Cohen, Malloy, and Pomorski, 2012), we include *Book-to-market*, *Firm size*, *Stock turnover*, and *Idiosyncratic volatility* as control variables.

(Insert Table 2 Here)

As shown in Panel A of Table 2, the OLS regression results show that *Turnover ratio* is positively associated with all profitability measures, which suggests that shareholder investment horizons have a negative effect on insider trading profitability. This association is not only statistically significant at the 1% level, it is also economically important: one standard deviation decrease in a firm's *Turnover ratio* (0.0555) leads to a 0.54% (0.66%, 0.86%) decrease in three-month (six-month, twelve-month) abnormal returns after insider trades, which is 28.51% (29.69%, 34.55%) of the mean value of three-month (six-month, twelve-month) abnormal returns. Using duration as a measure of shareholder investment horizons in Panel B shows similar results on the relation between shareholder investment horizons and insider trading informativeness. *Duration*, which is positively related to horizons and negatively related to *Turnover ratio*, has a negative and significant effect on the profits insiders are able to exploit. Like *Turnover ratio*, the economic effects of *Duration* are also not trivial: one standard deviation increase in a firm's *Duration* (3.2302) reduces three-month (six-month, twelve-month) abnormal returns after insider trades by 0.48% (0.71%, 0.81%). Meanwhile, Columns (2), (5), and (8) in both Panel A and Panel B show that *Short-term ownership* is positively associated with all profitability measures. We interpret this positive relation as, compared to total institutional ownership, ownership by short-term institutions increases the abnormal returns insiders can exploit when they trade. Columns (3), (6), and (9) in both panels show *Long-term ownership* is negatively related to all profitability measures, providing evidence that long-term institutional ownership are effective in curbing the

informativeness of insider trading. Overall, our results support our main hypothesis that the heterogeneity of shareholder investment horizons determine insider trading profitability: short-term shareholders give insiders more profits in their trades, whereas long-term shareholder reduce negative impacts of insider trading by limiting the profits insiders are able to earn through trading. This suggests that aggravated information environment from shorter investor horizons is the dominant factor. The estimations of other control variables are consistent with prior literature. For example, we show a negative effect of *Total institutional ownership* on insider trading profitability, although it is only significant in two columns. This underlines the importance of including shareholder investment horizons when studying the impact of institution holding on insider trading. Insider trading profitability is also related to the market liquidity as we show that insiders can exploit more abnormal returns when *Stock turnover* is higher.

B. Profitability Persistence

A recent paper by Cline, Gokkaya, and Liu (2017) studies the persistence pattern of insider trading. They find that if an insider has persistently obtained positive abnormal returns through insider trading over the past, his future trades are also more informative. While their study is at the individual level, we adopt the notion and analyze the effects of shareholder investment horizons on the persistence of insider trading profitability at the firm level. Specifically, we construct an indicator variable that equals one for firms that have positive average annual insider trading profitability for the next three years in a row. The average annual insider trading profitability is the same insider trading profitability measure in Table 2. We estimate with Probit model due to the dichotomous nature of the dependent variable.

(Insert Table 3 Here)

We report the test results of profitability persistence in Table 3, where we use 6-month abnormal returns to measure firm level profitability. In untabulated tests, we also use 3-month and 12-month abnormal returns and obtain similar results. The coefficient of *Turnover ratio* (*Duration*) in Panel A (B) is positive (negative) and significant, indicating that insiders of firms with shorter shareholder investment horizons are more likely to persistently exploit their informational advantages. The marginal effect of *Turnover ratio* is 0.0974 at the means, which indicates that one standard deviation decrease in *Turnover ratio* (0.0555) reduces the probability of a firm obtaining persistent profitability by 0.54% at the means. *Duration* has a marginal effect of -0.0029 at the means, indicating that one standard deviation reduction in *Duration* (3.2302) would increase the probability of persistent insider trading profitability by 0.94% at the means. Similar to previous tables, short-term ownership and long-term ownership results are robust as we find both *Short-term ownership by turnover* and *Short-term ownership by duration* (*Long-term ownership by turnover* and *Long-term ownership by duration*) increase (decrease) the chance a firm will get positive abnormal returns every year for the next three years. After we control shareholder investment horizons, *Total institutional ownership* does not prevent profitability persistence as it instead has a positive effect. Consistent with our findings in the previous tests, insider trading profitability persistence is more pronounced when market liquidity is better, as shown by *Stock turnover* results. Results in this table provide further evidence that firms with longer shareholder investment horizons have less informativeness in their insiders' trades, which is another manifestation of the effects of institution investment horizons.

C. Routine (Opportunistic) Trades

Results up to this point show that shareholder investment horizons determine insider trading informativeness as insider trades in firms with more short-term institutional investors predict future stock returns better, and also lead to persistence in superior returns. It is still interesting to analyze whether insiders materially use various trading patterns and strategies to exploit their private information. In the next sections, we test the effects of shareholder investment horizons on insider trading patterns.

We first investigate the relation between shareholder investment horizons and firm-level routine trade percentage. Cohen, Malloy, and Pomorski (2012) show that routine trades are for liquidity purpose and contain little information, while non-routine trades are opportunistic and informative about future stock returns. Hence, if information asymmetry is the dominant factor as this paper to this point has found, we would expect that insiders of firms with longer shareholder investment horizons use more routine trades, which are not related to proprietary information. Tests in this section address this empirical question. [8]

(Insert Table 4 Here)

Column (1) in Panel A of Table 4 presents the estimation results of routine trade percentage on *Turnover ratio*. One standard deviation decrease in *Turnover ratio* (0.0555) causes a 7.58% increase in routine trades. Column (1) of Panel B shows similar results when we use *Duration* as a measure for shareholder investment horizons. Not only statistically significant, a one standard deviation in *Duration* (3.2302) will also increases the percentage of routine trades in a firm-year by 2.84%. Taken together, these results indicate that insiders in firm with longer shareholder

[8] Compared to other insider trading informativeness tests in this paper, the number of observations for this test sample is much smaller, mainly because we follow the spirit of Cohen, Malloy, and Pomorski (2012) and only keep insiders with at least three years of trading history in a row to identify their routine trades and opportunistic trades.

investment horizons trade more for liquidity reasons rather than taking advantage of their private information. In other words, long-term institutional investors reduce opportunistic insider trading and help set a transparent financial market. For robustness consideration, we also run regression of routine trade percentage on short- and long-term ownership and find consistent results: by both definitions (*Turnover ratio* and *Duration*), short-term institutions are associated with more opportunistic trades, whereas long-term institutions discourage such trades.

D. Insider Trading Horizon

Employing a novel insider trading horizon measure, Akbas, Jiang, and Koch (2018) show that the frequency of insider switching between buying and selling is indicative of insider trading informativeness: trades by short horizon insiders are more informative than those by long horizon insiders. We adopt their measure and test the association between insider trading horizon and shareholder investment horizons in Table 5.

(Insert Table 5 Here)

In Columns (1) to (3) of both panels, we use the insider trading horizon measure calculated over year t+1 to year t+5. To provide robustness and closely follow the methodology by Akbas, Jiang, and Koch (2018), we also report test results with the insider trading horizon over year t+1 to year t+10 in Column (4). In doing so our sample size is reduced to 26,470 because we have to end financial and institutional data in 2006 to match the ten-year insider trading horizon estimated from 2007 to 2016. In Panel A (B), *Turnover ratio* (*Duration*) of institutions' shareholder investment horizons is positively (negatively) related to the turnover measure of the insider trading horizon, and this relation holds at the 1% level for both 5-year and 10-year measures. It means that firms with longer shareholder investment horizons also have insiders with longer trading horizons,

as insiders in these firms do not switch between buying and selling repeatedly over the years to reap more profits from their informational advantages. We separate the effects from short-term ownership and long-term ownership in Columns (2) and (3), and our results show that short-term institutional holding increases insider trading turnover and decreases insider trading horizon, whereas long-term institutional holding reduces insider trading turnover and extends insider trading horizon. In unreported tests, we also study the effects of short- and long-term institutional holdings on ten-year insider trading horizon, and the results are quantitatively similar and available upon request. Consistent with Akbas, Jiang, and Koch (2018), smaller firms in our sample have shorter insider trading horizon, as reflected by larger insider trading turnover. Firms with better liquidity (*Stock turnover*) are also able to switch buying and selling more often. *Total institutional ownership* has a positive effect on insider trading horizon, except for Column (2) of Panel A. This suggests that it is imperative to control for shareholder investment horizons as they could be a more robust factor than total institutional holdings in determining insider trading behaviors.

E. Sequenced Trades

Biggerstaff, Cicero, and Wintoki (2017) find that insiders tend to strategically delay the information disclosures to the market when they engage in extended sequences of trades, and these sequenced trades predict larger abnormal returns. Therefore, we use sequenced trades as proxy for the informativeness of insider trading and investigate whether shareholder investment horizons have any effect on this insider trading pattern.

(Insert Table 6 Here)

Table 6 presents the regression results. As shown in Column (1) of Panel A (B), the sequenced trade percentage is negatively (positively) associated with *Turnover ratio* (*Duration*). More specifically, one standard deviation decrease in *Turnover ratio* (0.0555) corresponds to a 1.26% decrease in sequenced trades, whereas one standard deviation increase in Duration (3.2302) reduces sequenced trades by 2.85%. In Column (2), we find that sequenced trade percentage increases as short-term ownership increases, whereas long-term ownership reduces the sequenced trades in Column (3), regardless whether ownerships are defined by *Turnover Ratio* or *Duration*. Overall, our results provide evidence that institutional investors with long-term shareholder investment horizons enhance information transparency, so insiders are less likely to use patterns to take advantage of insiders' informational advantages at the expense of other shareholders. On the contrary, short-term investors exacerbate information environment, so that insiders are more likely to have long-lived private information. Hence, they use sequenced trades over consecutive months to exploit the longevity of their informational advantages. Consistent with Biggerstaff, Cicero, and Wintoki (2017), Table 6 shows that sequenced trades are more frequent in smaller firm (*Firm Size*) with more growth potential (*Book-to-market*). They are also more likely to occur in risky firm (*Idiosyncratic volatility*) with higher liquidity (*Stock turnover*) and less institutional holdings.

Collectively, results in Tables (4) through (6) show a consistent picture that shareholder investment horizons are an important determinant of insiders' strategies to exploit their informational advantages. With longer investment horizons and more long-term institutions, insiders are less likely to engage in opportunistic trades, change trading direction from one year to the next, and trade in sequences to maximize their personal gains.

V. Robustness Checks

A. The Instrument Variables and Endogeneity

Studying the influence of shareholder investment horizons on insider trading is challenging due to the potential endogeneity issues, such as omitted variables and simultaneity. For example, it is likely that factors such as prior stock returns might have an impact on both shareholder investment horizons and informed trading activities. It is also plausible that shareholder investment horizons are influenced by the insider trading if short-term investors are more attracted by the information content conveyed by the insider trading than long-term investors. Thus, the naïve correlation between shareholder investment horizons and insider trading might not indicate a causal relation.

Motivated by the recent literature (Appel, Gormley, and Keim, 2016; Crane, Michenaud, and Weston, 2016) on Russell index reconstitution, we employ the Russell 1000/2000 annual index reconstitution to address these endogeneity concerns. Schmidt and Fahlenbrach (2017) and Fich, Harford, and Tran (2015) use Russell 1000/2000 index switches as instrumental variables for the level of shareholder ownership. We adopt their methodology with an important difference: we use index switches as instruments for shareholder investment horizons. The Russell 1000 comprises the largest 1,000 U.S. stocks by market capitalization, and the Russell 2000 comprises the next largest 2,000 U.S. stocks by market capitalization. In each June Russell reconstitutes these indexes to reflect the changes in stocks' ranking by market capitalization. We therefore exploit these index switching firms from Russell reconstitution and use the switches as a random shock to shareholder investment horizons.

We posit that *Index Change* companies will have shorter investment horizons as reflected by higher turnover and shorter duration due to rebalancing after index reconstitution. However, the reductions in horizons *might* be more significant for companies switch from the Russell 2000 to the Russell 1000 ($R_{2000,i,t-1} \rightarrow R_{1000,i,t}$ henceforth) than for companies switch from the Russell 1000 to the Russell 2000 ($R_{1000,i,t-1} \rightarrow R_{2000,i,t}$ henceforth). There are economic reasons to expect such relations which justify the relevance condition of index switches as valid instruments. On the one hand, the association between Russell indexes and many investment products, such as mutual funds, index funds, and ETFs, suggests that these indexes are preferred habitats for some investors and natural categories for others (Barberis, Shleifer, and Wurgler, 2005). This suggests an exogenous demand shock (Wurgler and Zhuravskaya, 2002) which significantly reduces shareholder investment horizons: after index switches, stocks of switching firms are sold (bought) heavily by index funds that track the previous (current) index. On the other hand, the index switching direction, whether it is from the Russell 1000 to the Russell 2000 or from the Russell 2000 to the Russell 1000, could have a significant impact on horizon change. Because Russell indexes are value weighted, a stock at the bottom of the Russell 1000 Index, which has a smaller market capitalization than most of the other companies in the Russell 1000, has much less weight than a stock at the top of the Russell 2000 index, which has a larger market capitalization than most of the other companies in the Russell 2000.[10] Thus, a stock moving from the Russell 1000 Index to the Russell 2000 Index (from the Russell 2000 Index to the Russell 1000 Index) will be held much more (less) heavily by these index-tracking institutions after reconstitution (Appel, Gormley, and Keim, 2016; Schmidt and Fahlenbrach, 2017). As these index-tracking institutions

[10] Schmidt and Fahlenbrach (2017) find that market-capitalization-based weights of the lowest ranking members of the Russell 1000 are approximately ten times smaller than the weights of the highest ranking members of the Russell 2000.

tend to be passive and long-term investors, passive investor losing ($R_{2000,i,t-1} \rightarrow R_{1000,i,t}$) companies will have more reduction in shareholder investment horizons after reconstitution than passive investor gaining ($R_{1000,i,t-1} \rightarrow R_{2000,i,t}$) companies.

For the first stage tests, we first construct two indicator variables: *Index Change* equals one for companies that switch index from year t-1 to year t, regardless of the direction; *Index Change* * ($R_{1000,i,t-1} \rightarrow R_{2000,i,t}$) equals one for companies that switch from the Russell 1000 Index in year t-1 to the Russell 2000 Index in year t, and we use this indicator to capture the difference in turnover ratio change between two index change directions. However, since the switches in the Russell indexes are based upon market capitalization rank change in May, it is important for us to include firms' market capitalization rank change ($(Rank_{i,t-1} \rightarrow Rank_{i,t})/100$ henceforth) to make index membership switches random (Schmidt and Fahlenbrach, 2017). In this setting, three variables *Index Change*, *Index Change* * ($R_{1000,i,t-1} \rightarrow R_{2000,i,t}$), and $(Rank_{i,t-1} \rightarrow Rank_{i,t})/100$ consist of the index switches conditional on the change in market capitalization rank, which satisfies the exclusion restriction of these instrumental variables. Thus, in the first stage, we regress shareholder investment horizons, measured by *Turnover ratio* and *Duration* respectively, on these three variables as the set of instruments and also other control variables used in main tests.

$$Turnover\ ratio_{i,t}\ or\ Duration_{i,t} = \alpha_t + \theta_j + bX_{i,q} + \beta 1\ Index\ Change + \beta 2\ Index\ Change * (R_{1000,i,t-1} \rightarrow R_{2000,i,t}) + \beta 3\ (Rank_{i,t-1} \rightarrow Rank_{i,t})/100 + \varepsilon_{i,t} \quad (8)$$

We match both *Turnover ratio* and *Duration* at the fourth quarter of year t to the index reconstitution in year t, because Russell determines its index weights at the end of June (Crane, Michenaud, and Weston, 2016). α_t indicates year fixed effects, and θ_j are industry fixed effects. Moreover, $X_{i,t}$ denotes a vector of firm characteristic variables included in eq. (7). We then used the predicted turnover ratio and duration from eq. (8) to replicate tests from Tables 2 through 6.

(Insert Table 7 around here)

We verify the relevance condition of our first stage estimations in Column (1) of Table 7. Note that the sample sizes for our tests on five types of insider trading informativeness measures vary, so we run the eq. (8) five times for to produce the predicted turnover ratio and predicted duration for each test sample accordingly. However, we only show the first stage results of the profitability test sample for brevity reasons, while first stage results for other samples are qualitatively similar. The results in Column (1) of Panel A support our predictions: after a company changes index, its turnover ratio increases by 0.93%, suggesting the flipping of company stocks after its index switch. *Index Change * (*$R_{1000,i,t-1} \rightarrow R_{2000,i,t}$*)*, is negative and significant, which indicates the difference in turnover change between two directions. For companies moving from the Russell 2000 Index to the Russell 1000 Index, the index switch results in loss of ownership by long-term passive investors who track their positions following index weights, so their turnover ratio is even higher. On the other hand, for companies moving from the Russell 1000 Index to the Russell 2000 Index, they see an increase in long-term passive investors so their turnover increase due to index switch is subdued. In Column (1) of Panel B, we also find that switching index will reduce shareholder investment horizons as it reduces duration by 0.3903 quarter. However, there is no significant difference in duration decrease between two index switching directions, for *Index Change * (*$R_{1000,i,t-1} \rightarrow R_{2000,i,t}$*)* is positive but not significant. This is not surprising and is related to the methodology of duration measure construction. Unlike turnover ratio, this duration measure captures the actual holding relationship between an institution and a firm, and it does not show the type of institution in general. In other words, whether it is an influx of long-term institutions or short-term institutions in June will make a significant difference on turnover ratio by December,

but will not impact duration as much.[11] To summarize, results in this Column (1) of both Panels confirm the relevance condition of our instrumental variables. Our test sample sizes are smaller in these regressions, as we only include observations with Russell index information in both years t-1 and t (Schmidt and Fahlenbrach, 2017).

The second stage results using the predicted value of *Turnover ratio* are shown in Columns (2) through (6) of Panel A, for insider trading profitability, profitability persistence, routine trades, insider trading horizon, and sequenced trades, respectively. Results of these insider trading informativeness measures with the predicted value of *Duration* are reported in Columns (2) through (6) of Panel B. We show 6-month profitability for insider trading profitability in Column (2), and the results are consistent if we use 3-month or 12-month profitability. Consistent with our primary findings, we find positive (negative) effects of predicted turnover ratio (duration) on insider trading profitability, persistence of profitability, insider trading horizon, and sequenced trades, and the predicted turnover ratio (duration) also has a negative (positive) impact on routine trades. Four of these five relations are significant at the 1% level, while the relation between the predicted turnover ratio and profitability persistence is significant at the 5% level. Collectively, results in this table show that the attenuating effects of shareholder investment horizons on the insider trading informativeness are robust after endogeneity issues are alleviated with the instrumental variables method.

B. Alternative Turnover Measures

[11] The influx of short-term investors reduces turnover ratio more than the influx of long-term investors. In terms of duration, however, both new short-term investors and long-term investors that come in June will have a duration of 2 quarters by December.

To provide robustness, we also construct an alternative measure of institutional investor turnover (*Turnover2*), which excludes investor-flow induced trading.[12] Following Yan and Zhang (2009), we use the minimum of the aggregate purchase and sale instead of the sum of the two to calculate institutional investor i's churn rate for quarter q ($ChurnRate2_{i,q}$) to minimize the influence of investor cash flows on portfolio turnover:

$$ChurnRate2_{i.q} = \frac{min(ChurnRatio\_buy_{i,q},\ ChurnRatio\_sell_{i,q})}{\sum_{k=1}^{N_k} \frac{(S_{k,i,q}P_{k,q} + S_{k,i,q-1}P_{k,q-1})}{2}} \qquad (9)$$

We then calculate institutional investor turnover of firm k for quarter q (*Turnover2*) as:

$$Institutional\ investor\ turnover\ of\ firm\ k\ (Turnover2) =$$

$$\sum_{i=1}^{J_i} w_{k,i,q} \left\langle \frac{1}{4} \sum_{r=0}^{3} ChurnRate2_{i,q-r} \right\rangle \qquad (10)$$

Similar to our primary measure *Turnover ratio*, high (low) *Alternative turnover ratio* indicates short (long) average shareholder investment horizons.

(Insert Table 8 around here)

We report the test results with *Alternative turnover ratio* in Table 8. Test results for the effects of *Alternative turnover ratio* on insider trading profitability, insider trading horizon, sequenced trades, routine trades, and profitability persistence are shown in Columns (1) through (5), respectively. We find that with this alternative measure, higher turnover ratio (shorter shareholder investment horizon) also causes higher insider trading profitability, higher probability of persistent positive profits, less routine trades, shorter insider trading horizon as reflected by higher insider trading turnover, and more sequenced trades. In unreported tests, we calculate long-

[12] Alexander, Cici, and Gibson (2007) find that trades due to investor flow contain little information.

term institutional holding and short-term institutional holding by *Alternative turnover ratio*, and the results are consistent with those in Tables (2) through (6). Hence, the primary findings in this study are not sensitive to the measurements of shareholder investment horizons.

C. Profitability of Purchases and Sales

In this paper we study the impact of shareholder investment horizons on the informativeness of insider trading, regardless of whether they are purchases or sales. In the insider trading literature, however, many studies find that the informativeness of purchases is more prevalent than the informativeness of sales (Penman, 1985; Lin and Howe, 1990; Bettis, Coles, and Lemmon, 2000; Lakonishok and Lee, 2001; Roulstone, 2003). In this section, we follow the insider trading literature and analyze insider purchases and sales separately. Specifically, we calculate the firm level average insider trading profitability by all insider purchases and by all insider sales, respectively, and then repeat tests in Table 2 with these two variables. We only report 6-month profitability measures in Table 9, while the 3-month and 12-month measures yield similar results, which are available upon request.

(Insert Table 9 around here)

Table 9 provides evidence that shareholder investment horizons are associated with the insider trading informativeness for both sales and, to a lesser degree, purchases. We show the results of insider purchase profitability in columns 1 to 3. In Panel A, we find that both *Turnover ratio* and *Short-term ownership by turnover* have a positive and significant effect on the profitability. The coefficient of *Long-term ownership by turnover* is negative, although its p-value is just outside of the significance level at 0.121. Furthermore, results in columns (4) through (6)

show that insider sale profitability is also impacted by shareholder investment horizons: *Turnover ratio* increases insider selling profits, and *Short-term ownership by turnover* (*Long-term ownership by turnover*) is positively (negatively) associated with insider selling profits. All of these three coefficients are significant at the 1% level. The insider sale profitability moderating effect of shareholder investment horizons is also supported by the duration results in columns (4) through (6) of panel B: *Duration* significantly reduces insider sale profitability, and *Short-term ownership by duration* (*Long-term ownership by duration*) is positively (negatively) related to insider selling profits. As reported in columns (1) through (3) of Panel B, however, duration measures do not have any significant effect on insider purchase profitability. Control variables in this table show some interesting results: *Total institutional ownership* is effective in curbing insider trading profitability through sales, however it is not effective for limiting profits through purchases as we find that it actually has a positive and significant effect on insider trading profitability through purchases. In addition, insiders obtain higher trading profits through sales when market is more liquid. Nevertheless, when market is illiquid, insiders are able to get more trading profits through purchases. Collectively, we show that shareholder investment horizons impact insider trading informativeness through sales, and we also find some weaker results that horizons also reduce insider purchase informativeness.

VI. Conclusion

The results in our study depict a significant relation between shareholder investment horizons and insider trading activities. Using both turnover ratio and duration as horizon measures, we find that insider trades have higher profitability and contain more information when firms have shorter shareholder investment horizons. More specifically, short-term institutional investors

increase insider trading informativness while long-term institutional investors reduce it. Insiders in firms with shorter investment horizons are also more likely to obtain positive trading profits persistently. Moreover, these insiders are more likely to engage in informed trades, such as engaging in more opportunistic trades and having a shorter investment horizon. In addition, insiders in firms with shorter shareholder investment horizons are also more likely to trade in sequences to exploit their informational advantages. Exploiting the random annual index reconstitution by Russell, we are able to study the exogenous effect of shareholder investment horizons on insider trading informativeness. Collectively, this paper shows that shorter investor horizons exacerbate the degree of information asymmetry between insiders and other investors, which leads to higher insider trading profitability through exploitations of their informational advantages.

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Table 1: Summary Statistics

This table presents the descriptive statistics of the sample. The sample includes 68,488 observations from 1986 to 2016 for insider trading data. Informativeness measures, shareholder investment horizon measures, and control characteristics are all at the firm-year level. See Section III.B for explanations of informativeness measures. See Section III.C for explanations of shareholder investment horizon measures. For control variables, Book-to-market ratio is the book value of a company's equity divided by the market value of equity. Firm size is defined as the market capitalization of the firm in millions of dollars. Stock turnover is the average daily stock volume divided by the number of shares outstanding over the calendar year. Idiosyncratic volatility is computed as the standard deviation of the residuals from regressing the risk-free rate-adjusted daily stock returns on the Fama-French (1993) factors over the calendar year. All continuous variables are winsorized at the 1st and 99th percentiles.

Variable	Mean	SD	P25	Median	P75	N
Informativeness Measures						
3-month profitability	0.0187	0.1795	-0.0719	0.0129	0.1063	47945
6-month profitability	0.0222	0.2680	-0.1146	0.0187	0.1586	47950
12-month profitability	0.0250	0.4136	-0.1794	0.0247	0.2365	47959
Profitability Persistence	0.1257	0.3316	0	0	0	39597
Routine Trades	0.2098	0.3764	0	0	0.2080	17232
Insider trading horizon	-0.9131	0.1103	-1.0000	-0.9533	-0.8601	39465
Sequenced Trades	0.1995	0.2764	0	0	0.3333	50293
Shareholder Investment Horizon Measures						
Turnover ratio	0.1945	0.0555	0.1585	0.1908	0.2245	68488
Short-term ownership by turnover	0.1480	0.1223	0.0478	0.1250	0.2193	68488
Long-term ownership by turnover	0.1328	0.1049	0.0463	0.1104	0.2001	68488
Duration (in quarters)	5.9476	3.2302	3.6393	5.8828	7.9493	68486
Short-term ownership by duration	0.1289	0.1345	0.0317	0.0889	0.1793	68486
Long-term ownership duration	0.1984	0.1805	0.0250	0.1619	0.3315	68486
Control Variables						
Book-to-market	0.5776	0.5426	0.2610	0.4741	0.7802	68488
Firm size (market cap)	2144.33	6295.40	80.42	304.64	1198.07	68488
Stock turnover	0.0070	0.0071	0.0022	0.0047	0.0092	68488
Idiosyncratic volatility	0.0318	0.0187	0.0185	0.0274	0.0402	68488
Total institutional ownership	0.4922	0.2961	0.2339	0.4900	0.7435	68488

Table 2: Insider Trading Profitability

This table presents the results from OLS regressions of the insider trading profitability. In Panel A, we use turnover ratio to measure shareholder investment horizons. In Panel B, we use duration to measure shareholder investment horizons. In Columns (1), (2), and (3), the dependent variable is average 3-month profitability, calculated as three-month abnormal returns after the insider trades. In Columns (4), (5), and (6), the dependent variable is average 6-month profitability, calculated as six-month abnormal returns after the insider trades. In Columns (7), (8), and (9), the dependent variable is average 12-month profitability, calculated as twelve-month abnormal returns after the insider trades. In Columns (1), (4), and (7), the main explanatory variable is the turnover ratio, which is the weighted average churn rate of all institutional investors in a firm-year. In Columns (2), (5), and (8), the main explanatory variable is short-term ownership, which is the percentage of shares held by short-term institutional investors in a firm-year. In Columns (3), and (6), and (9), the main explanatory variable is long-term ownership, which is the percentage of shares held by long-term institutional investors in a firm-year. Year fixed effects and industry fixed effects (two-digit SIC) are included with robust standard errors. The numbers in the parentheses are p-values (*** p<0.01, ** p<0.05, * p<0.1).

Panel A: Turnover ratio

	3-month profitability (1)	3-month profitability (2)	3-month profitability (3)	6-month profitability (4)	6-month profitability (5)	6-month profitability (6)	12-month profitability (7)	12-month profitability (8)	12-month profitability (9)
Turnover ratio	0.0965***			0.1186***			0.1558***		
	(0.000)			(0.000)			(0.003)		
Short-term ownership by turnover		0.0461***			0.0509***			0.0485*	
		(0.000)			(0.001)			(0.057)	
Long-term ownership by turnover			-0.0286***			-0.0268*			-0.0492*
			(0.009)			(0.095)			(0.054)
Total institutional ownership	-0.0008	-0.0087*	-0.0007	-0.0066	-0.0153*	-0.0089	-0.0124	-0.0173	-0.0131
	(0.850)	(0.099)	(0.889)	(0.287)	(0.062)	(0.238)	(0.236)	(0.198)	(0.305)
Book-to-market	0.0015*	0.0015*	0.0014*	0.0010	0.0010	0.0009	-0.0007	-0.0008	-0.0008
	(0.069)	(0.071)	(0.086)	(0.352)	(0.350)	(0.431)	(0.724)	(0.695)	(0.672)
Firm size	-0.0006	-0.0006	-0.0007	-0.0004	-0.0004	-0.0005	-0.0009	-0.0009	-0.0009
	(0.345)	(0.367)	(0.335)	(0.700)	(0.722)	(0.656)	(0.629)	(0.631)	(0.612)
Stock turnover	0.5749***	0.5786***	0.6331***	0.9678***	0.9668***	1.0389***	1.0581***	1.1045***	1.1444***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.003)	(0.002)
Idiosyncratic volatility	0.1288	0.1294	0.1309	0.1695	0.1700	0.1724	0.3071	0.3091	0.3104
	(0.145)	(0.144)	(0.147)	(0.220)	(0.219)	(0.221)	(0.183)	(0.183)	(0.184)
# of Observations	47,945	47,945	47,945	47,950	47,950	47,950	47,959	47,959	47,959

Panel B: Duration

	3-month profitability (1)	3-month profitability (2)	3-month profitability (3)	6-month profitability (4)	6-month profitability (5)	6-month profitability (6)	12-month profitability (7)	12-month profitability (8)	12-month profitability (9)
Duration	-0.0015***			-0.0022***			-0.0025***		
	(0.000)			(0.000)			(0.000)		
Short-term ownership by duration		0.0196***			0.0353***			0.0520***	
		(0.000)			(0.000)			(0.000)	
Long-term ownership by duration			-0.0269***			-0.0421***			-0.0559***
			(0.000)			(0.000)			(0.000)
Total institutional ownership	-0.0004	-0.0022	0.0030	-0.0059	-0.0123*	0.0013	-0.0116	-0.0189	-0.0037
	(0.925)	(0.637)	(0.504)	(0.335)	(0.090)	(0.852)	(0.262)	(0.112)	(0.745)
Book-to-market	0.0014*	0.0014*	0.0014*	0.0010	0.0010	0.0010	-0.0007	-0.0007	-0.0007
	(0.077)	(0.082)	(0.077)	(0.333)	(0.363)	(0.347)	(0.718)	(0.706)	(0.713)
Firm size	-0.0007	-0.0006	-0.0005	-0.0004	-0.0001	-0.0001	-0.0009	-0.0005	-0.0006
	(0.334)	(0.408)	(0.442)	(0.694)	(0.911)	(0.900)	(0.623)	(0.771)	(0.752)
Stock turnover	0.6009***	0.6153***	0.5911***	0.9464***	0.9648***	0.9350***	1.0694***	1.0680***	1.0413***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.004)	(0.006)
Idiosyncratic volatility	0.1281	0.1292	0.1277	0.1646	0.1657	0.1648	0.3038	0.3031	0.3026
	(0.149)	(0.149)	(0.148)	(0.226)	(0.227)	(0.225)	(0.187)	(0.187)	(0.186)
# of Observations	47,945	47,945	47,945	47,950	47,950	47,950	47,959	47,959	47,959

Table 3: Profitability Persistence

This table presents the results from Probit regressions of the profitability persistence. In Panel A, we use turnover ratio to measure shareholder investment horizons. In Panel B, we use duration to measure shareholder investment horizons. The dependent variable is a dummy indicating whether the firm has positive insider trading profitability for three years in a row. In Column (1), the main explanatory variable is the turnover ratio, which is the weighted average churn rate of all institutional investors in a firm-year. In Column (2), the main explanatory variable is short-term ownership, which is the percentage of shares held by short-term institutional investors in a firm-year. In Column (3), the main explanatory variable is long-term ownership, which is the percentage of shares held by long-term institutional investors in a firm-year. Year fixed effects and industry fixed effects (two-digit SIC) are included with robust standard errors. The numbers in the parentheses are p-values (*** p<0.01, ** p<0.05, * p<0.1).

Panel A: Turnover ratio

	Profitability Persistence (1)	Profitability Persistence (2)	Profitability Persistence (3)
Turnover ratio	0.4746***		
	(0.001)		
Short-term ownership by turnover		0.3064***	
		(0.002)	
Long-term ownership by turnover			-0.3969***
			(0.001)
Total institutional ownership	0.0980***	0.0034	0.1886***
	(0.004)	(0.941)	(0.000)
Book-to-market	-0.0046	-0.0044	-0.0045
	(0.376)	(0.396)	(0.384)
Firm size	0.0289***	0.0293***	0.0305***
	(0.000)	(0.000)	(0.000)
Stock turnover	2.0707**	1.6972*	1.8218*
	(0.043)	(0.099)	(0.072)
Idiosyncratic volatility	0.0821	0.0817	0.0788
	(0.706)	(0.709)	(0.719)
# of Observations	39,226	39,226	39,226

Panel B: Duration

	Profitability Persistence (1)	Profitability Persistence (2)	Profitability Persistence (3)
Duration	-0.0143***		
	(0.000)		
Short-term ownership by duration		0.1440**	
		(0.016)	
Long-term ownership by duration			-0.2285***
			(0.000)
Total institutional ownership	0.1068***	0.0503	0.1739***
	(0.002)	(0.210)	(0.000)

Book-to-market	-0.0035	-0.0047	-0.0045
	(0.503)	(0.360)	(0.392)
Firm size	0.0294***	0.0316***	0.0322***
	(0.000)	(0.000)	(0.000)
Stock turnover	0.9546	1.9513*	1.3999
	(0.366)	(0.056)	(0.179)
Idiosyncratic volatility	0.0202	0.0566	0.0456
	(0.930)	(0.798)	(0.839)
# of Observations	39,226	39,226	39,226

Table 4: Routine Trades

This table presents the results from Tobit regressions of the insider routine trades. In Panel A, we use turnover ratio to measure shareholder investment horizons. In Panel B, we use duration to measure shareholder investment horizons. The dependent variable is the average percentage of routine trades in a firm-year. Routine trades are defined as the insider trades that are placed by the same trader in the same calendar month for at least three consecutive years (Cohen, Malloy, and Pomorski, 2012). In Column (1), the main explanatory variable is turnover ratio, which is the weighted average churn rate of all institutional investors in a firm-year. In Column (2), the main explanatory variable is short-term ownership, which is the percentage of shares held by short-term institutional investors in a firm-year. In Column (3), the main explanatory variable is long-term ownership, which is the percentage of shares held by long-term institutional investors in a firm-year. Year fixed effects and industry fixed effects (two-digit SIC) are included with robust standard errors. The numbers in the parentheses are p-values (*** p<0.01, ** p<0.05, * p<0.1).

Panel A: Turnover ratio

	Routine Trades (1)	Routine Trades (2)	Routine Trades (3)
Turnover ratio	-1.3662***		
	(0.000)		
Short-term ownership by turnover		-1.1250***	
		(0.000)	
Long-term ownership by turnover			0.7403***
			(0.000)
Total institutional ownership	-0.0384	0.0338	0.0095
	(0.554)	(0.697)	(0.907)
Book-to-market	-0.0119	-0.0119	-0.0113
	(0.198)	(0.196)	(0.225)
Firm size	0.0863***	0.0859***	0.0871***
	(0.000)	(0.000)	(0.000)
Stock turnover	-2.5608	-2.2757	-3.2514
	(0.208)	(0.264)	(0.111)
Idiosyncratic volatility	2.9857**	3.0216**	2.7224*
	(0.036)	(0.033)	(0.056)
# of Observations	17,232	17,232	17,232

Panel B: Duration

	Routine Trades (1)	Routine Trades (2)	Routine Trades (3)
Duration	0.0121**		
	(0.045)		
Short-term ownership by duration		-0.2294**	
		(0.025)	
Long-term ownership by duration			0.2314**
			(0.032)
Total institutional ownership	-0.0406	-0.0037	-0.0518

	(0.532)	(0.962)	(0.481)
Book-to-market	-0.0116	-0.0118	-0.0117
	(0.210)	(0.202)	(0.207)
Firm size	0.0863***	0.0848***	0.0859***
	(0.000)	(0.000)	(0.000)
Stock turnover	-2.8828	-2.6217	-2.7563
	(0.162)	(0.195)	(0.178)
Idiosyncratic volatility	2.8968**	3.1206**	2.9667**
	(0.046)	(0.030)	(0.039)
# of Observations	17,232	17,232	17,232

Table 5: Insider Trading Horizon

This table presents the results from Tobit regressions of the insider trading horizon. In Panel A, we use turnover ratio to measure shareholder investment horizons. In Panel B, we use duration to measure shareholder investment horizons. In Columns (1), (2), and (3), the dependent variable is average insider trading turnover over a five-year moving window (Akbas, Jiang, and Koch, 2017). In Column (4), the dependent variable is average insider trading turnover rate over a ten-year moving window. In Columns (1) and (4), the main explanatory variable is the turnover ratio, which is the weighted average churn rate of all institutional investors in a firm-year. In Column (2), the main explanatory variable is short-term ownership, which is the percentage of shares held by short-term institutional investors in a firm-year. In Column (3), the main explanatory variable is long-term ownership, which is the percentage of shares held by long-term institutional investors in a firm-year. Year fixed effects and industry fixed effects (two-digit SIC) are included with robust standard errors. The numbers in the parentheses are p-values (*** p<0.01, ** p<0.05, * p<0.1).

Panel A: Turnover ratio

	Insider Trading Horizon - Five Year Turnover (1)	Insider Trading Horizon - Five Year Turnover (2)	Insider Trading Horizon - Five Year Turnover (3)	Insider Trading Horizon - Ten Year Turnover (4)
Turnover ratio	0.1665***			0.1123***
	(0.000)			(0.000)
Short-term ownership by turnover		0.1011***		
		(0.000)		
Long-term ownership by turnover			-0.0862***	
			(0.000)	
Total institutional ownership	0.0268***	-0.0062	0.0464***	0.0188***
	(0.000)	(0.279)	(0.000)	(0.000)
Book-to-market	-0.0002	-0.0002	-0.0002	0.0004
	(0.308)	(0.277)	(0.253)	(0.361)
Firm size	-0.0057***	-0.0055***	-0.0052***	-0.0070***
	(0.000)	(0.000)	(0.000)	(0.000)
Stock turnover	0.1899	0.1925*	0.3108***	0.1462
	(0.102)	(0.099)	(0.007)	(0.226)
Idiosyncratic volatility	0.0367	0.0374	0.0385	-0.0129
	(0.168)	(0.160)	(0.148)	(0.559)
# of Observations	39,465	39,465	39,465	26,470

Panel B: Duration

	Insider Trading Horizon - Five Year Turnover (1)	Insider Trading Horizon - Five Year Turnover (2)	Insider Trading Horizon - Five Year Turnover (3)	Insider Trading Horizon - Ten Year Turnover (4)
Duration	-0.0038***			-0.0032***
	(0.000)			(0.000)
Short-term ownership by duration		0.0690***		
		(0.000)		

Long-term ownership by duration			-0.0679***	
			(0.000)	
Total institutional ownership	0.0318***	0.0119***	0.0550***	0.0228***
	(0.000)	(0.010)	(0.000)	(0.000)
Book-to-market	-0.0002	-0.0002	-0.0002	0.0006
	(0.299)	(0.245)	(0.257)	(0.216)
Firm size	-0.0059***	-0.0050***	-0.0052***	-0.0071***
	(0.000)	(0.000)	(0.000)	(0.000)
Stock turnover	-0.0162	0.1642	0.1146	-0.1153
	(0.892)	(0.163)	(0.335)	(0.353)
Idiosyncratic volatility	0.0208	0.0309	0.0306	-0.0240
	(0.434)	(0.247)	(0.251)	(0.278)
# of Observations	39,465	39,465	39,465	26,470

Table 6: Sequenced Trades

This table presents the results from Tobit regressions of the insider sequenced trades. In Panel A, we use turnover ratio to measure shareholder investment horizons. In Panel B, we use duration to measure shareholder investment horizons. The dependent variable is the average percentage of sequenced trades in a firm-year. Sequenced trades are insider trades in the same direction in multiple consecutive months, allowing for one-month gap (Biggerstaff, Cicero, and Wintoki, 2017). In Column (1), the main explanatory variable is turnover ratio, which is the weighted average churn rate of all institutional investors in a firm-year. In Column (2), the main explanatory variable is short-term ownership, which is the percentage of shares held by short-term institutional investors in a firm-year. In Column (3), the main explanatory variable is long-term ownership, which is the percentage of shares held by long-term institutional investors in a firm-year. Year fixed effects and industry fixed effects (two-digit SIC) are included with robust standard errors. The numbers in the parentheses are p-values (*** p<0.01, ** p<0.05, * p<0.1).

Panel A: Turnover ratio

	Sequenced Trades (1)	Sequenced Trades (2)	Sequenced Trades (3)
Turnover ratio	0.2272***		
	(0.000)		
Short-term ownership by turnover		0.2352***	
		(0.000)	
Long-term ownership by turnover			-0.3950***
			(0.000)
Total institutional ownership	-0.0798***	-0.1519***	0.0083
	(0.000)	(0.000)	(0.550)
Book-to-market	-0.0057***	-0.0055***	-0.0051**
	(0.006)	(0.008)	(0.013)
Firm size	-0.0182***	-0.0180***	-0.0165***
	(0.000)	(0.000)	(0.000)
Stock turnover	0.4962*	0.3059	0.2873
	(0.091)	(0.298)	(0.322)
Idiosyncratic volatility	0.1886**	0.1854**	0.1697*
	(0.033)	(0.037)	(0.057)
# of Observations	50,293	50,293	50,293

Panel B: Duration

	Sequenced Trades (1)	Sequenced Trades (2)	Sequenced Trades (3)
Duration	-0.0088***		
	(0.000)		
Short-term ownership by duration		0.2091***	
		(0.000)	
Long-term ownership by duration			-0.2029***
			(0.000)
Total institutional ownership	-0.0729***	-0.1470***	-0.0112

	(0.000)	(0.000)	(0.390)
Book-to-market	-0.0048**	-0.0054***	-0.0053**
	(0.020)	(0.010)	(0.010)
Firm size	-0.0183***	-0.0149***	-0.0159***
	(0.000)	(0.000)	(0.000)
Stock turnover	-0.0132	0.0792	-0.0004
	(0.965)	(0.788)	(0.999)
Idiosyncratic volatility	0.1202	0.1278	0.1348
	(0.186)	(0.155)	(0.134)
# of Observations	50,293	50,293	50,293

Table 7: 2SLS Analysis with IVs

This table presents the results from 2SLS analysis with instrumental variables. Column (1) shows the estimation of the first stage regression for the 6-month profitability test sample. Index Change is a dummy that takes one if the firm switched either from the Russell 1000 to the Russell 2000 or vice versa, and zero otherwise. Index Change * (R1000,i,t-1 → R2000,i,t) is a dummy that takes one if the firm switched from the Russell 1000 to the Russell 2000. (Ranki,t-1 → Ranki,t) / 100 is the change of ranking within Russell indices from year t-1 to year t. Column (2) to (6) includes the estimations of the second stage regressions. In Column (2), the dependent variable is insider trading profits as shown by 6-month profitability. In Column (3), the dependent variable is the dummy for persistent profitability. In Column (4), the dependent variable is the average percentage of routine trades. In Column (5), the dependent variable is insider trading horizon. In Column (6), the dependent variable is the average percentage of sequenced trades. Year fixed effects and industry fixed effects (two-digit SIC) are included with robust standard errors. The numbers in the parentheses are p-values (*** p<0.01, ** p<0.05, * p<0.1).

Panel A: Turnover ratio

	First Stage	Second Stage				
	Turnover	6-month Profitability	Profitability Persistence	Routine Trades	Insider Trading Horizon	Sequenced Trades
	(1)	(2)	(3)	(4)	(5)	(6)
Index Change	0.0093***					
	(0.000)					
Index Change * (R1000,i,t-1 → R2000,i,t)	-0.0113***					
	(0.000)					
(Ranki,t → Ranki,t-1) / 100	-0.0008***					
	(0.000)					
Predicted turnover ratio		0.2169***	1.7085**	-5.4134***	0.6479***	3.4274***
		(0.000)	(0.033)	(0.000)	(0.000)	(0.000)
Total institutional ownership	0.0129***	-0.0082	0.0031	0.0526	-0.0092	-0.1252***
	(0.000)	(0.471)	(0.966)	(0.603)	(0.149)	(0.000)
Book-to-market	-0.0039***	-0.0121	-0.0998***	-0.1563***	-0.0022	-0.0432***
	(0.000)	(0.135)	(0.005)	(0.006)	(0.367)	(0.000)
Firm size	-0.0034***	-0.0033	0.0039	0.0589***	-0.0084***	-0.0166***
	(0.000)	(0.161)	(0.725)	(0.000)	(0.000)	(0.000)
Stock turnover	1.6080***	1.2723	-0.0575	-3.0177	-0.5857*	-3.3321***
	(0.000)	(0.149)	(0.990)	(0.574)	(0.060)	(0.001)
Idiosyncratic volatility	0.0187	0.0542	-0.0190	5.5677**	0.0395*	0.0327

	(0.385)	(0.274)	(0.940)	(0.035)	(0.098)	(0.713)
# of Observations	26,131	26,131	21,855	10,872	19,657	26,849

Panel B: Duration

	First Stage	Second Stage				
	Duration	6-month Profitability	Profitability Persistence	Routine Trades	Insider Trading Horizon	Sequenced Trades
	(1)	(2)	(3)	(4)	(5)	(6)
Index Change	-0.3903***					
	(0.000)					
Index Change * (R1000,i,t-1 → R2000,i,t)	0.0008					
	(0.994)					
(Ranki,t → Ranki,t-1) / 100	0.0243***					
	(0.000)					
Predicted duration		-0.0057***	-0.0262**	0.1194***	-0.0161***	-0.0327***
		(0.000)	(0.030)	(0.000)	(0.000)	(0.001)
Total institutional ownership	-0.1748**	-0.0113	0.0041	0.0435	-0.0014	-0.0861***
	(0.030)	(0.244)	(0.947)	(0.644)	(0.804)	(0.000)
Book-to-market	0.2044***	-0.0120	-0.0967***	-0.1511***	-0.0013	-0.0537***
	(0.000)	(0.169)	(0.003)	(0.004)	(0.579)	(0.000)
Firm size	0.2638***	-0.0038	0.0187	0.0609***	-0.0060***	-0.0193***
	(0.000)	(0.402)	(0.434)	(0.000)	(0.000)	(0.000)
Stock turnover	-109.4338***	1.3825	-6.1087	-4.3147	-1.3115***	-1.2167
	(0.000)	(0.423)	(0.545)	(0.382)	(0.000)	(0.303)
Idiosyncratic volatility	-2.8604	0.0641	-0.1954	5.0360	0.0067	0.0047
	(0.107)	(0.336)	(0.574)	(0.103)	(0.788)	(0.960)
# of Observations	26,131	26,131	21,855	10,872	19,657	26,849

Table 8: Alternative Turnover Ratio

This table presents the results of regressions using an alternative measure of shareholder investment horizons. The main independent variable is based upon the minimum of the aggregate purchase and sale to reduce the influence of investor cash flows on portfolio turnover. In Column (1), the dependent variable is insider trading profits as shown by 6-month profitability. In Column (2), the dependent variable is the dummy for persistent profitability. In Column (3), the dependent variable is the average percentage of routine trades. In Column (4), the dependent variable is insider trading horizon. In Column (5), the dependent variable is the average percentage of sequenced trades. Year fixed effects and industry fixed effects (two-digit SIC) are included with robust standard errors

	6-month Profitability (1)	Profitability Persistence (2)	Routine Trades (3)	Insider Trading Horizon (4)	Sequenced Trades (5)
Turnover ratio (alternative)	0.2966***	1.5919***	-2.9663***	0.3874***	0.5283***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Total institutional ownership	-0.0069	0.0943***	-0.0363	0.0252***	-0.0816***
	(0.272)	(0.006)	(0.576)	(0.000)	(0.000)
Book-to-market	0.0010	-0.0045	-0.0119	-0.0002	-0.0058***
	(0.371)	(0.387)	(0.198)	(0.291)	(0.005)
Firm size	-0.0004	0.0288***	0.0862***	-0.0057***	-0.0183***
	(0.690)	(0.000)	(0.000)	(0.000)	(0.000)
Stock turnover	0.9814***	1.9335*	-2.5612	0.2219*	0.5282*
	(0.000)	(0.060)	(0.212)	(0.057)	(0.073)
Idiosyncratic volatility	0.1706	0.0846	2.9698**	0.0394	0.1935**
	(0.220)	(0.696)	(0.037)	(0.139)	(0.029)
# of Observations	47,950	39,226	17,232	39,465	50,293

Table 9: Insider Trading Profitability for Purchases and Sales

This table presents the results from OLS regressions of the insider trading profitability of purchases and sales separately. In Panel A, we use turnover ratio to measure shareholder investment horizons. In Panel B, we use duration to measure shareholder investment horizons. In Columns (1), (2), and (3), the dependent variable is average 6-month profitability for purchases, calculated as six-month abnormal returns after the insider purchases. In Columns (4), (5), and (6), the dependent variable is average 6-month profitability for sales, calculated as six-month abnormal returns after the insider sales. In Columns (1) and (4), the main explanatory variable is turnover ratio, which is the weighted average churn rate of all institutional investors in a firm-year. In Columns (2) and (5), the main explanatory variable is short-term ownership, which is the percentage of shares held by short-term institutional investors in a firm-year. In Columns (3) and (6), the main explanatory variable is long-term ownership, which is the percentage of shares held by long-term institutional investors in a firm-year. Year fixed effects and industry fixed effects (two-digit SIC) are included with robust standard errors. The numbers in the parentheses are p-values (*** p<0.01, ** p<0.05, * p<0.1).

Panel A: Turnover ratio

	6-month profitability (purchases) (1)	6-month profitability (purchases) (2)	6-month profitability (purchases) (3)	6-month profitability (sales) (4)	6-month profitability (sales) (5)	6-month profitability (sales) (6)
Turnover ratio	0.1829***			0.1144***		
	(0.000)			(0.002)		
Short-term ownership by turnover		0.0517*			0.0839***	
		(0.054)			(0.000)	
Long-term ownership by turnover			-0.0437			-0.0737***
			(0.121)			(0.000)
Total institutional ownership	0.0432***	0.0320*	0.0441***	-0.0256***	-0.0416***	-0.0178*
	(0.001)	(0.054)	(0.002)	(0.003)	(0.000)	(0.064)
Book-to-market	-0.0043	-0.0047	-0.0051	0.0019*	0.0021*	0.0020*
	(0.369)	(0.327)	(0.281)	(0.091)	(0.080)	(0.084)
Firm size	-0.0043**	-0.0043**	-0.0043**	0.0010	0.0012	0.0012
	(0.017)	(0.018)	(0.019)	(0.403)	(0.349)	(0.336)
Stock turnover	-0.7650**	-0.6810*	-0.6094*	1.8361***	1.7226***	1.7895***
	(0.038)	(0.063)	(0.096)	(0.000)	(0.000)	(0.000)
Idiosyncratic volatility	0.3422	0.3589	0.3672	0.1509	0.1483	0.1488
	(0.136)	(0.118)	(0.109)	(0.255)	(0.252)	(0.254)
# of Observations	28,416	28,416	28,416	38,079	38,079	38,079

Panel B: Duration

	6-month profitability (purchases) (1)	6-month profitability (purchases) (2)	6-month profitability (purchases) (3)	6-month profitability (sales) (4)	6-month profitability (sales) (5)	6-month profitability (sales) (6)
Duration	-0.0006			-0.0050***		
	(0.415)			(0.000)		
Short-term ownership by turnover		-0.0297			0.0758***	
		(0.117)			(0.000)	

Long-term ownership by turnover			-0.0072			-0.0792***
			(0.686)			(0.000)
Total institutional ownership	0.0439***	0.0551***	0.0442***	-0.0237***	-0.0413***	-0.0097
	(0.001)	(0.000)	(0.007)	(0.005)	(0.000)	(0.272)
Book-to-market	-0.0053	-0.0055	-0.0051	0.0024*	0.0021*	0.0021*
	(0.261)	(0.246)	(0.281)	(0.062)	(0.077)	(0.077)
Firm size	-0.0043**	-0.0048***	-0.0043**	0.0013	0.0020	0.0018
	(0.019)	(0.007)	(0.016)	(0.295)	(0.106)	(0.140)
Stock turnover	-0.5615	-0.5236	-0.6097	1.5254***	1.6738***	1.6365***
	(0.132)	(0.157)	(0.105)	(0.000)	(0.000)	(0.000)
Idiosyncratic volatility	0.3878*	0.4029*	0.3671	0.1271	0.1357	0.1376
	(0.094)	(0.078)	(0.109)	(0.272)	(0.273)	(0.266)
# of Observations	28,416	28,416	28,416	38,079	38,079	38,079