GRIPS Discussion Paper 15-14

The Five-Day Workweek System and Investor Inattention on Friday Earnings Announcements: Evidence from Korea's Stock Market

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September 2015

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Acknowledgement

We thank Jeremy Stein and Lawrence F. Katz for their excellent guidance. We also would like to express our gratitude to seminar participants at Harvard Graduate Student Seminar, Eastern Economic Association and Asian Econometric Society for their valuable comments.

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Abstract

Do investors always allocate their attention properly? If not, what potentially drives investors inattention? This paper shows that work schedule can have an influence on the level of attention investors pay. Using the introduction of the five-day workweek system in financial sector of Korea in 2002 as a natural experiment, the paper suggests work schedule can be a key factor driving investor inattention to Friday earnings announcements. Our stock return analyses show stronger immediate response and weaker delayed response to Friday news under the six-day workweek system. The trend was, however, reversed under the five-day workweek system, showing more sluggish immediate response and stronger delayed response to Friday earnings announcements. These findings state that the trade-off between weekend distraction and additional working hours during weekend determines investors attention to Friday earnings announcements.

Key Words: investor inattention, workweek system, earnings announcements, Friday inattention, investor reaction

1 Introduction

Does work schedule affect people's attention across days of a week? Can this happen even in the most efficient place such as a stock market? Though measuring attention is a difficult job, we can still find substantial examples which strategically use people’s differential attention across days of a week. For example, it is conventional wisdom that companies save layoff notice until Friday because workers would have a weekend to absorb the emotional shock. Similarly, companies and central banks release bad news mostly on Friday to abate the market response to negative news. All of these examples indicate that people's attention to market is unevenly distributed across days of a week.

While there are recent papers on the Friday effect in financial market, there is relatively little research on the underlying mechanism. Bagnoli et al (2005) find that there is a sluggish initial response to Friday earnings news and Dellavigna and Pollet (2009) show that the weekend distraction causes investors inattention to Friday earnings news.

This paper attempts to show one of the underlying sources of inattention induced by the weekend distraction is a workweek system using the unique natural experiment in Korea: transition from the six-day workweek system to the five-day workweek system. Korea adopted the five-day workweek system in financial sectors in 2002 and it provides us an opportunity to observe the relationship between workweek schedule and investor response on Friday news. We find that there is less attention to Friday earnings announcements under the five-day workweek system and there is more attention to Friday earnings announcements under the six-day workweek system. These support our claim that work schedule has an influence on investors attention across days of a week.

People have limited capacity of attention which they allocate properly in making economic decisions. Because of this limited capacity of attention, people allocate their attention considering the cost of paying attention. For instance, when people are at work, the cost of attention is relatively low and thus they can pay more attention to their work efficiently because there is less distraction. When they have other chores which can potentially distract them, however, they cannot pay enough attention to their work because the cost of attention is relatively high.

Under the five-day workweek schedule, investors are distracted by weekends and it is difficult to pay sufficient attention to earnings announcements released on Friday even though they have two more days to analyze the news. Under the six-day workweek schedule, however, investors can allocate more attention to earnings news released on Fridays, because investors have whole Saturday morning additionally to review the earnings announcements without any disruption in the office. Hence, earnings news released on Friday virtually receives more attention than earnings news released on other weekdays under the six-day workweek system. This finding states that even though the same amount of time is given to process earnings information, the allocation of attention to Friday earnings news would vary according to the workweek system.

Our study owes its basic concepts of investor inattention to the existing literature in behavioral finance. Bernard and Thomas (1989) examine two alternative explanations for post-earnings-announcement drift: risk-premium adjustment and delayed price response. They conclude that much of their data is consistent with the delayed response hypothesis rather than the risk-premium hypothesis. Their findings suggest that some investors at least temporarily neglect the information contained in earnings surprise. Also, theoretical models were developed to explain bounded rationality of investors and post-earnings-announcement drift in stock market.

Hong and Stein (1999) construct the model which shows that investors' cognitive limit causes under-reaction to information in the short-run while momentum traders' strategy will lead overreaction in the long run. Hirshleifer and Teoh (2003) offer an analytical model of financial reporting when investors have limited attention and information processing power. Their model implies that informationally equivalent disclosures by firms can have different effects on investor perceptions depending on the form of presentation.

In addition, there have been many empirical studies on investor inattention to earnings announcements in several circumstances. Barber and Odean (2008) demonstrate that investors buy attention-grabbing stocks and argue that investors have limited attention and allocate it to stocks with more salient features. Hirshleifer, Lim and Teoh (2009) test whether there is more sluggish response to earnings announcements on days with more relevant earnings news. Their results show that there is less immediate response when the number of relevant announcements is greater. Their findings can be explained by competition for investors' attention between a firm's earnings disclosures. Cheng et al (2015) show that low-attention leads to greater underreaction to repurchase announcements. Furthermore, Bagnoli, Clement, and Watts (2005) reexamine the conventional wisdom that after-hours and Friday earnings announcements tend to be negative news. Their analyses show that strategic release of earnings news on Friday has not ended by removal of barriers of media coverage in the mid-1990s.

Our study is most inspired by the paper by Dellavigna and Pollet (2009). In their work, they found strong evidence in stock returns and trading volume to support the hypothesis that there is investor inattention to Friday earnings news due to weekend distraction. Dellavigna and Pollet, however, do not fully discuss the trade-off between additional two days and distraction during weekends for Friday inattention and conclude that weekends distract the investors and cause less attention to Friday news even though they have two more days to analyze the information. Our work is in line with Dellavigna and Pollet by showing that allocation of attention according to work schedule is a key factor of weekend distraction driving investors' inattention to earnings announcements released on Friday. Therefore, our results contribute to the existing literature by showing that work schedule can affect the cost of attention and thus lead investor inattention to the news.

This paper proceeds as follows. In section 2, we describe our data set and the five-day workweek system of Korea in detail. In section 3, we briefly discuss whether earnings news released on Friday and non-Friday are comparable. No systematic differences in firm size are found in our sample except that firms maximizing short-term share value release negative (positive) news on the days with high (low) distraction. For instance, under the six-day workweek system, firms release good news on Friday when investors pay more attention. On the other hand, firms announce worse earnings on Friday when investors pay less attention. In section 4, we present immediate and delayed stock return responses to earnings announcements. Our estimated results indicate that there exists more initial reaction to Friday earnings news under the six day workweek system and less initial reaction under the five-day workweek system. The more initial reaction (or less initial reaction) to Friday earnings news was followed by smaller post earnings announcement drift (or larger post earnings announcement drift) subsequently.

We also test responsiveness of trading volume in section 5. We found out the evidence of attenuated abnormal volume corresponding to less immediate stock return responsiveness around the earnings announcement day. The volume results suggest that less immediate response in stock return was driven by investor inattention rather than disagreement on earnings news or less accurate forecasts. We discuss alternative explanations in section 6. Three possible explanations are considered: after-market announcements, pre-announcement release and firm heterogeneity. We examine why none of these theories can fully explain our empirical evidence. Section 7 concludes the paper with summary of our inference.

2 The Introduction of Five-Day Workweek System in Korea

It is no doubt that the adoption of the five-day workweek system in Korea was one of the major social changes in Korea during the last two decades. Not only did it raise political struggle among government, labor, and business before its enactment, it also drew attention from both academia and business about its extensive effect on the workers' life pattern and productivity.

The gradual reduction of legal working hours has been under way over two decades in Korea. Since it was legislated as 48 hours in 1953, there was first attempt in 2000 which decreased legal weekly working hours to 40 hours, and following attempt in 2003 led gradual adoption of working week of 40 hours. As in other European countries, reduction of working hours aimed to increase job sharing and employment. However, its introduction also faced strong backlash from corporations which concerned decrease in productivity along with increased labor cost.

<Table 1 to be Inserted Here>

Table 1 shows phased decrease in working hours across firms and industries. This paper focuses on voluntary introduction of working week of 40 hours in non-banking financial sector in November 2002. Finance sector and its union agreed to reduce weekly working hours to 40 hours two years prior to its legislation. Even though it was the 40-hour workweek system in legal parlance, it virtually changed the six day workweek system to the five-day workweek system and involved the noticeable change in the weekly life pattern of all affected workers.

<Figure 1A and Figure 1B to be Inserted Here>

Figure1A and Figure 1B show that the introduction of five-day workweek system significantly reduced the number of monthly working days and hours in finance and insurance industry, without such clear impact on total working hours compared to those of other major industries. The similar results are confirmed by Yang and Geum (2009) whose study analyzed Korean Labor Panel to investigate the impact of five-day work week system on the number of working days and working hours of affected workers. The total working hour shows steady decrease over time, but no distinct reduction right after the introduction of policy. It is suggested that workers' preference of income over leisure or partial enforcement of law might have caused these trends.

Nevertheless, it is reported that two-day long weekend changed various aspects of workers' lives. Yang and Geum (2009) reported increased leisure time with no change in expenditure for leisure. A study by Kim, Kim, and Kim (2003) analyzed the sample of financial sector workers to investigate the impact of five-day workweek system on their time allocation. The workers under five-day workweek system spent more time and money, and they were also more likely to spend it with their family. Various consumer reports also showed change in shopping or TV ratings across days of a week. All these findings consistently illustrate that the workweek system significantly affected people's weekly routine.

Workers under the five-day workweek system allocate their attention to work in different way compared to workers under six-day workweek system. And the effect of new workweek system on workers in financial sector would be different from that of workers at the production lines at automobile factory. Workers at financial sector such as analysts, institutional investors, and fund managers work with information coming from the market every day; they analyze, interpret, and respond to those information. Since market sends information continuously over time, their attention to information issued during the weekend can be affected by the change in their work schedule. We propose that investors hired by financial institutes would show different response to market information under two different workweek systems as their allocation of attention changes according to work schedule.

3. Data and Summary Statistics

3.1 Data and Variables Construction

Korea Exchange (KRX) was ranked as the world's top 12 stock exchanges by value of shares traded in 2007. It is definitely one of the most active emerging markets in the world with 1757 companies listed by December 31, 2007. Korea Exchange adopted electronic announcement system (KIND) in April 1999, only second to the United States, to fairly provide information to all investors. The system simplified the submission process of all disclosures and facilitated information diffusion among investors. KRX also implemented Regulation Fair Disclosure (FD) in November, 2002 to prevent firms from selectively offering information to analysts and brokers. It is reported that market response became more salient after the introduction of FD which implies that information leakage before earnings news was decreased.

In this study, we analyze investor reaction to earnings announcements data drawn from three sources: earnings announcements data from Bloomberg, earnings forecasts data from FnGuide, the largest company in Korea collecting and publishing various financial data, and stock returns and trading volume from the Korea Exchange. We chose Bloomberg because they provide reliable and up to date financial data and news from all over the world. We also manually checked the Bloomberg data and KIND reports to guarantee the reliability of information[2]. All quarterly earnings announcements from Bloomberg were matched with earnings forecasts in FnGuide. Our data covers the period from 2000 to 20011 when all earnings announcements were supposed to be submitted through KIND, the online system.

The earnings forecast data includes earnings forecasts by individual analysts from 47 brokerage firms from 2000 to 2011.[3] The consensus forecast is defined as the median forecast among all the analysts who made forecasts. If an analyst made multiple forecasts, we chose only the most recent one. We restricted the sample to forecasts made within the 90 calendar days before the earnings announcements to make it a reliable proxy for the true expectations of market.

We combined earnings announcement and forecast data with actual earnings, stock returns and trading volumes from KRX. Cumulative abnormal returns around each announcement date is calculated based on a regression using past stock returns before the announcement date. Let $R_{t,k}$ denote the stock return of company k on day t, and let $R_{t,m}$ denote the market return on day t. Then we obtain $\hat{\beta}_{q,k}$ for company k in quarter q, using the regression $R_{t,k} = \propto_{q,k} + \beta_{q,k} R_{t,m}$ for days t from $\tau - 300$ to $\tau - 46$, where τ indicate the announcement date. Then, we calculated abnormal return according to Dellavigna and Pollet (2009):

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[2] We found out significant discrepancy in early years of data. We assumed that KIND data is more correct and changed all discrepancy of data until 2002. After 2002, the rate of discrepancy fell significantly and we assumed we can take such amount of measurement error.

[3] Before 2003, forecast data exists only for each company's 4th quarters. Even though estimates are for annual forecasts, since analysts made a forecast after companies announced the 3rd quarter earnings, we treated this information as equivalent to quarterly earnings forecasts.

$$AR = [\prod_{j=\tau+h}^{\tau+H} (1 + R_{j,k})] - 1 - \hat{\beta}_{q,k}[\prod_{j=\tau+h}^{\tau+H} (1 + R_{j,m}) - 1]$$

for company k in quarter q. The abnormal return will be used as indicator of investor reaction following earnings announcements.

For analyses throughout the paper, we define earnings surprise as the difference between actual earnings announced and the consensus earnings forecast, normalized by the stock price (Kothari 2001)[4]. Let $e_{q,k}$ denote actual earnings per share announced in quarter q for company k, and let $\hat{e}_{q,k}$ denote median earnings forecast made for company k in quarter q. Then earnings surprise is constructed as $s_{q,k} = \frac{e_{q,k} - \hat{e}_{q,k}}{P_{q,k}}$, where $P_{q,k}$ is the price of the shares of company k five trading days before the announcement date in quarter q.

<Table 2 to be Inserted Here>

3.2 Summary Statistics

Table 2 shows the distribution of earnings announcements collected by Bloomberg, across days of a week. The distribution shows that almost half of earnings announcements are released either in the beginning of the week or the end of weekdays. Weekend earnings announcements account for about 5% in general. Under the six-day workweek system, Friday earnings announcements are over-represented, because data of this period mostly contains 4th quarter earnings announcements. There was a convention to announce 4th quarter earnings announcement on Friday to make it easy to hold annual meeting of shareholders at the same time. The concentration of 4th quarter earnings announcements on Fridays become weaker as firms

[4] Korean firms started to move from Generally Accepted Accounting Principles (GAAP) to International Financial Reporting Standards (IFRS) in 2009. We matched forecast and actual earnings according to each accounting standard.

release pre-earnings announcements ahead of shareholder meeting in later years.

Our basic sample matched earnings announcement data with earnings forecast, returns, and other control variables. We eliminated observations with missing earnings surprise, either with no recent forecast or actual earnings data. We excluded penny stocks with values lower than 1000 won[5] since their price could be excessively volatile because of speculative investors. Announcements made on Saturday, Sunday or holidays are also omitted from the sample. Finally, outliers in earning surprise are excluded to prevent bias caused by unusual situation.

<Table 3 to be Inserted Here>

To ensure unbiased estimate of investor reaction, the average characteristics of announcements released on Friday and other weekdays should have no systematic differences. Such bias can be caused by sample selection or firms' strategic announcement behavior. We compare average characteristics of earnings announcements on Fridays and other weekdays in Table 3. To make it comparable over time, we decide to use quantile of each character calculated within each quarter rather than absolute measures. Then, for each announcement date, we compute average characteristics of announcements that investors face.

<Figure 2 to be Inserted Here>

Table 3 shows that basic sample contains 17 Fridays and 42 other weekdays under the six-day workweek system. From the perspective of investors, average earnings announcements released on Friday and non-Fridays are pretty much equivalent. Figure 2 also shows that the distributions of average size of companies in each earnings surprise quantiles are quite similar across announcement day and workweek system. However, under the five-day workweek system,

[5] Two thousand won is approximately equal to two US dollars. We lowered criterion to be one thousand won when we examine delayed and long-run responses since these accumulated returns are less likely to be affected by temporary volatility in stock price.

there is a statistically significant difference in terms of average earnings surprises released on Friday and other weekdays; Friday announcements are on average more negative compared to non-Friday announcements. It suggests that firms with negative earnings shock might choose Friday to mitigate the shock on purpose. On the other hand, under the six-day workweek system, Friday announcements are more positive because managers would want to use investors attention strategically. We would further discuss strategic firm behavior when we interpret our results in later chapters.

4. The Evidence from Stock Returns

In this chapter, we investigate the sensitivity of stock returns to earnings news across weekdays under the two different workweek regimes. We employ stock return responses to earnings surprises in the short run and the long run as a measure of immediate inattention and later catch-up. If investors are more distracted by longer weekends under the reduced workweek system, then we should observe less immediate responses to Friday announcements relative to that of other weekdays. The less immediate responses will be accompanied by more delayed responses over time as investors realize their under-reaction and adjust stock price. Our DDD (Differences-in-Differences-in-Differences) strategy tests the hypothesis that relative response to Friday earnings news in the short run is more sluggish under the five-day workweek system. Accordingly long-run response to Friday earnings news would be relatively higher under the new regime compared to old workweek system.

To construct a measure of earnings surprises, we divided earnings surprises into nine groups by magnitude. Negative earnings surprises are included in quantiles 1 through 4, followed by zero surprises in quantile 5. Zero surprises are defined as earnings surprises whose absolute values are smaller than 0.002. Positive surprises are included in quantiles 6 through 9. The thresholds for each quantile are computed separately for each quarter.

4.1 Identification Strategy Using Top and Bottom Quantiles

In this section, we show our estimation strategy using very positive earnings news (top two quantiles) and very negative earnings news (bottom two quantiles). Then, we compare the differences in Friday sensitivity under two different workweek systems in terms of immediate, delayed and long-term responses. Following simple DDD strategy estimate differential Friday effect under the two different workweek systems:

$$R_{q(q,k)}^{(h,H)} = \beta_0 + \beta_1 d_{q,k}^{Top} + \beta_2 d_{q,k}^{F} + \beta_3 d_{q,k}^{w} + \beta_4 d_{q,k}^{Top} d_{t,k}^{F} + \beta_5 d_{q,k}^{F} d_{q,k}^{w} \qquad (1)$$

$$+\beta_6 d_{q,k}^{Top} d_{q,k}^{w} + \beta_7 d_{q,k}^{Top} d_{q,k}^{w} d_{q,k}^{F} + \Gamma_0 X_{q,k} + \Gamma_1 d_{q,k}^{Top} X_{q,k} + \varepsilon_{q,k}$$

, where $R_{q,k}^{(h,H)}$ denotes cumulative abnormal return for the time period ($\tau + \mathrm{h}$, τ+H) after announcement day τ for company k in quarter q. This regression uses only the top and bottom quantiles and $d_{q,k}^{Top}$ is an indicator equal to 1 if the observation belongs to the top quantiles. A dummy variable $d_{q,k}^{F}$ denotes whether the announcement was released on Friday ($d_{q,k}^{F} = 1$) or not ($d_{q,k}^{F} = 0$). An indicator $d_{q,k}^{w}$ represents five-day workweek system ($d_{q,k}^{w} = 1$) or six-day workweek ($d_{q,k}^{w} = 0$), at the time of the earnings announcements release.

In this equation fixed effects controls for difference in stock returns between top and bottom quantiles (β_1), time-invariant difference in stock returns to Friday earnings news (β_2), and change in overall stock returns after the adoption of the new workweek system (β_3). The second-level interactions capture difference in top-minus-bottom stock responses to Friday earnings news and non-Friday earnings news (β_4), the change in responses to Friday announcements over time (β_5), and change in differential stock returns to top quantile news relative to bottom quantile news over time (β_6). We are interested in the coefficient of the third-level interaction (β_7) which captures the change in stock return sensitivity to Friday earnings announcements (relative to non-Friday earnings announcements) under the five- day workweek system (relative to the six day workweek system). Under our hypothesis that five-day workweek system induces investor inattention to Friday earnings news, we expect to estimate negative β_7 for immediate returns, $R_{q,k}^{(0,1)}$. As investors realize their under-reactions to earnings news released on Fridays, they would show greater response later in time and it will be captured by positive β_7 for delayed returns, $R_{q,k}^{(2,55)}$.

We also include a set of controls $X_{q,k}$ in our specification. Monthly dummy variables are included to control time trends and differences between early and late announcements within a quarter. It is also possible that stock responsiveness and company size are related if large companies draw more attention from investors. Therefore, we control for decile of number of employees and market capitalization as proxy variables for company size. To construct the decile of market capitalization and employee size, we divide firms into ten groups according to variables within each quarter of our sample period. The indicator of KSE/KOSDAQ is included since those two markets have different type of firms, IPO process and regulating body. We also added interaction term between all included control variables and indicator of top quantile to capture differential response to earnings surprises according to different characteristics of firms and markets. Finally, standard errors are clustered by day of announcement in all regressions to allow correlations of stock returns on the same day.

Additionally, we also included the set of dummy variables indicating each decile of number of announcements released on the same day in several regressions to check robustness of results. This variable is constructed from the original Bloomberg data to calculate the amount of earnings news released on each day. The breakpoints of decile are determined within each quarter to make it comparable across time. In our data, the portion of earnings announcements on Friday is higher than that on other weekdays in general. The estimated coefficient to measure Friday inattention could be biased if the number of announcements is a real factor driving investor inattention. Controlling the number of announcements in the regression would control potential bias from investor distraction caused by the amount of earnings information released each day.

4.2 Immediate Response Results using Top and Bottom Quantiles

<Table 4 to be Inserted Here>

Table 4 demonstrates regression results using $R_{q,k}^{(0,1)}$ as a dependent variable. The dependent variable $R_{q,k}^{(0,1)}$ measures return from the closing of the market on the day before the announcement to the closing of the market on the day after the announcement to include stock price movement to after-market announcements. Since the size of immediate return is usually very small, we applied stricter rule of sample and excluded volatile stocks whose price is less than 2,000 won. Regression (1) and (2) covers period from 2000 to 2011 while regression (3) and (4) used data between 2000 and 2008 to prevent any bias coming from subprime shock on the stock market.

Regression (1) shows that the abnormal return to top quantile is very small and insignificant if announcements are made on non-Friday under the six day workweek system. We interpret that average response to those news are not strong enough to dominate other influences affecting stock market. Estimation shows that top-to-bottom returns for Friday earnings news is significantly higher than that for other weekdays (β_4=0.026) under the six day workweek system. This finding is consistent over all regressions. However, the magnitude of the estimated coefficient of the three-way interaction term demonstrates that the five-day workweek system not only eliminates the positive top-to-bottom return differential for Friday earnings news under the six day workweek system, but also brings about lower top-to-bottom returns for Friday earnings news (β_7=-0.034) under the five-day workweek system. The change in top-to-bottom return differentials for Friday earnings announcements is significant at 1% in regression (1) and remains almost the same (β_7=-0.034) when we control for the number of announcements in regression (2).

Results using the pre-subprime period also show similar estimates in regression (3) and (4). Though immediate response to non-Friday earnings news is insignificant, estimated coefficient β_4 shows that there is significantly more immediate response to Friday earnings announcements under the six day workweek system. The three-way interaction show that the new workweek system changed differential stock return for the top minus the bottom quantiles for Friday earnings news at the 1% significance level. The magnitude of the estimated coefficients is slightly of bigger size than regression (1) and (2). In sum, all these estimates are consistent over different specifications and support our hypothesis that the workweek system determines the direction of differential immediate response to Friday earnings announcements.

4.3. Delayed and Long-Run Responses using Top and Bottom Quantiles

<Table 5 to be Inserted Here>

In Table 5, we examined delayed and long-run responses to examine the movement of post-earnings announcement drift and overall effect. In order to examine post-earnings announcement drift, we choose 55 trading days window after the announcement day, which is slightly shorter than 90 calendar days. This is to solve the problem that our estimated result being diluted by various pre-announcements which are usually released several weeks before the new earnings announcement. Firms who are delisted later were excluded from our sample since their later return are more likely to be affected by bad news related to delisting rather than earnings news announced much earlier.

In regressions (1)-(4) of Table 5, the estimated results show that there is significant and large magnitude of post-earnings announcement drift for the announcements released on non-Friday under the six day workweek system. It also shows that top-to-bottom post earnings announcement drift is lower for Friday earnings announcements under the six day workweek system. The estimated effect is statistically significant only when we control the number of announcements, but the sign and the magnitude is noticeable. Also, this result is consistent with the result we acquired using immediate stock returns. Higher delayed response is followed by lower immediate response, which confirms that earlier finding is not caused by the characteristics of earnings news, but inattention caused by workweek system. The estimated coefficient of a three-way interaction term also presents a significant change in differential post earnings announcement drift to Friday earnings news under the five-day workweek system. The magnitude of the estimated coefficient is large and significant across different specifications and sample periods. Results from delayed responses demonstrate that the movement of post earnings announcement drift is coherent with that of immediate responses and thereby support our hypothesis.

Finally, we examine the long run stock responses to earnings announcements. The same specifications we used to estimate immediate response and delayed response are employed in regression (5)-(8) of Table5. The results are very similar to those of delayed response, with smaller coefficients and less statistical significance. Though the magnitude of delayed response is bigger than that of immediate response, the size and statistical significance are canceled off by immediate response to some extent.

4.4. Results using All Announcements

4.4.1. Empirical Strategy

In this section, we use more comprehensive sample to measure the effect of the workweek system on stock returns responsiveness to earnings announcements across days of a week. We analyze the sensitivity of stock returns to earnings quantiles consisting of four quantiles for positive earnings news, one zero quantile for zero earnings surprise and four quantiles for negative earnings shocks. This quantile regression was proposed by Cheng et al. (1992) to tackle non-linearity problems in unexpected earnings response regression models and to mitigate bias from outliers.

We use OLS to estimate the following quantile regression

$$R_{q(q,k)}^{(h,H)} = \beta_0 + \beta_1 R_{q,k} + \beta_2 d_{t,k}^F + \beta_3 d_{q,k}^w + \beta_4 R_{q,k} d_{t,k}^F + \beta_5 d_{q,k}^F d_{q,k}^w \qquad (2)$$

$$+\beta_6 R_{q,k} d_{q,k}^w + \beta_7 R_{q,k} d_{q,k}^w d_{q,k}^F + \Gamma_0 X_{q,k} + \Gamma_1 R_{q,k} X_{q,k} + \varepsilon_{q,k}$$

, where $R_{q,k}$ denotes the quantile of earnings surprise for company k in quarter q. We include the same set of controls $X_{q,k}$ that we used in equation (1). All these control variables are also interacted with earnings surprise quantile to allow different response to earning surprise quantile depending on the various characteristics of firms and announcement day. Finally, the set of indicators for decile of the number of announcements are included in several specification and error terms are clustered within each earnings announcement day in all regressions. We estimate equation (2) using three different dependent variables as we did in previous section. In this estimation coefficients related to quantile measures the sensitivity of stock return responses to one quantile higher earnings news.

4.4.2. Stock Returns Response

<Table 6 to be Inserted Here>

Table 6 shows estimated results using all announcements to estimate the impact of workweek system on differential impact on immediate, delayed, and long-run stock return responses. Overall, results we found using top and bottom quantiles remains strong with reduced standard error.

In regression (1), we estimate equation (2) with immediate return as a dependent variable. Estimated coefficients show that there was more immediate response to Friday news under the six-day workweek system and while it changes as estimated three-way interaction term is significantly negative with larger size (β_7 =-0.004).

The impact on post-earnings announcement drift is reported in regression (2). Estimated β_1 shows statistically significant post-earnings announcement drift while negative β_4 proves that it was lower for Friday news under the six-day workweek system. This pattern is reversed under the five-day workweek system as estimated coefficient of three-way interaction term ($\beta_7 =$

0.017) is positive with dominant size. Concerning that average post-earnings announcement drift of stocks with positive earnings surprises are 0.009 after 55 trading days in our data, the estimated impact of workweek system is quite large and meaningful.

The estimated results for long-run response are also consistent with previous findings. Estimation result in regression (3) implies that the sensitivity of long run return from Friday earning news is lower compared to non-Friday news under the six-day workweek system. Conversely, the sensitivity of long run return from Friday earnings news is higher than non-Friday earnings news under the five-day workweek system. Our results in regression (4)-(6) remain consistent where we exclude post-financial crisis period.

In sum, the transition to the five-day workweek system reversed relative attention given to Friday news in the short run and catch-up in long run. This estimated change is consistent when we add various control variables or use different specification using all announcements and strongly supports our hypothesis that the five-day workweek is related to investor distraction during the weekend.

5. The Evidence from Trading Volume

Evidence from stock returns shows that there was significantly sluggish initial response to non-Friday earnings announcements under the six day workweek system and transition to the five-day workweek system reversed the trend and created the Friday effect. In this chapter, we examine whether we can find similar evidence from trading volume around earnings announcement day. If delayed response to earnings announcements is caused by lack of attention, then we should be able to find corresponding smaller trading volume around earnings announcement day.

Examining trading volume will also allow us to exclude some other hypotheses which might explain our evidence from stock returns. The more sluggish response to earnings news in the short run can be also caused by less accurate forecasts or high disagreement about earnings news. If more debatable earnings news is intentionally released on Friday (or non-Friday), then we cannot separately identify the effect of investor distraction from the effect of investor disagreement. In this case, investigating trading volume can help us to decide the source of the estimated effect since greater abnormal trading volume would be observed even though there is less immediate response to earnings news if it were caused by investor disagreement rather than investor distraction.

To examine abnormal trading volume around earnings announcement day, we employed the change in logarithm of trading volume as a dependent variable. This is to control the firm-specific trend in trading volume right before the earnings news. Earnings guidance and investor disagreement drive increasing trend of trading volume[6] right before the earnings news in many firms. To capture the immediate response of trading volume on earnings announcement day, we define the abnormal trading volume following Hirshleifer et al (2009)

$$v_{q,k}^{(h,H)} = \sum_{j=\tau+h}^{\tau+H} \frac{\Delta \log\left(V_{q,k}^{j}\right)}{H-h+1} - \sum_{j=\tau-15}^{\tau-5} \frac{\Delta \log\left(V_{q,k}^{j}\right)}{10} \qquad (3)$$

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[6] We employed Dickey-Fuller test found a unit root in many individual volume series in our sample around earnings announcement day.

, where $V_{q,k}^{j}$ is the number of shares traded on day j and τ is the date of the earnings announcement in quarter q for company k. $v_{q,k}^{(h,H)}$ measures abnormal change in trading volume during period $(\tau + h,\ \tau + H)$. As we are interested in the movement of trading volume around earnings announcement day, we use $v_{q,k}^{(0,1)}$ as the immediate abnormal volume change which corresponds to immediate stock returns response.

5.1 Empirical Strategy and Regression Results

To estimate whether the five-day workweek system affected the differential change in trading volume across Fridays and non-Fridays, we employ the following OLS specification

$$v_{q,k}^{(h,H)} = \beta_0 + \beta_1 d_{q,k}^{F} + \beta_2 d_{q,k}^{w} + \beta_3\left(d_{q,k}^{F} \times d_{q,k}^{w}\right) + \sum_{j=1}^{9} \gamma_j\, R_{q,k}^{j} + \Gamma X_{q,k} + F_k + \varepsilon_{q,k} \qquad (4)$$

, where $R_{q,k}^{j}$ is a dummy variable for each earnings surprise quantile. $X_{q,k}$ is a standard set of controls which includes year and month indicators for seasonal adjustment, decile of market capitalization within each quarter, and number of employees. Firm fixed effects are also included to control time invariant characteristics of each firm. Error terms are clustered by date of announcements to allow correlations among trading volume whose earnings announcements are released on the same day. Since the dependent variable measures the change of the trading volume in percentage, the estimated coefficients can be interpreted as percentage point change in trading volume caused by each independent variable. We also estimate the specifications with the value of traded shares as a dependent variable to test robustness of our results.

<Table 7 to be Inserted Here>

Table 7 shows the estimated results of equation (4) using number of stocks traded and value of stocks traded as a dependent variable. We included firm fixed effects and interacted control variables in all regressions. Results show consistent impact of workweek system on Friday effect across period.

In regression (2), it shows that trading volume on Fridays was 13.4 percentage point higher than that to non-Fridays under the six day workweek system. ($\widehat{\beta_1}$=0.134) However, the trend is reversed under the five-day workweek system as estimated $\widehat{\beta_3}$ is significantly negative with magnitude greater than $\widehat{\beta_1}$. ($\widehat{\beta_3}$=-0.157) The results are robustness across specifications and alternative measure of trading volume used in regression (4)-(6). It implies that the change in attention to earnings news was not focused on penny stocks or high-priced stocks.

Evidence from changes in trading volume to earnings news supports our results from stock returns to earnings news. Again, the change in trading volume is greater for Friday earnings announcements under the six day workweek system. In contrast, change in trading volume is smaller for Friday earnings announcements under the five-day workweek system. These evidences support our hypothesis that the five-day workweek system is a key factor causing investor inattention to Friday earnings news.

6 Alternative Explanations and Discussion

In this section, we discuss other possible interpretations of our findings: after-market announcements, pre-announcement release, and firm heterogeneity. We demonstrate that all these hypotheses have major inconsistencies with our data even though they can explain parts of our findings.

After-market announcements tend to contain negative news of big firms. Managers have an incentive to take advantage of institutional investors' limited opportunity to respond by releasing bad news after market close. Empirical evidence has not found any sluggish response to after-market announcements yet in US (Bagnoli, Clement and Watts 2005), however in theory, market will not be able to respond well to the information released after market close under reasonable assumptions. (Gannette and Trueman 1996)

Since Bloomberg data does not contain the exact timing of earnings announcement release, we randomly selected 10% of our sample and manually matched the data to KIND system to identify exact timing of earnings news. The sample shows that the proportion of after-market announcements is greater among Friday earnings news throughout our sample period. However, the portion of after-market announcements among Friday news sharply decreased under the five-day workweek system. It means that the composition of after-market news cannot explain our findings from the stock returns and trading volume. Moreover, it would have worked in the direction to cancel off our results if it had any effect.

In Korea, companies are required to report in advance if sales or profit changes more than 30% compared to the past year. And some large conglomerates release preliminary earnings announcements which contain earnings forecasts of their own. All these announcements contain significant information about actual earnings and are relevant to the increasing trend of trading volume right before the earnings announcement day.

If some companies send out more earnings guidance than other companies, then less immediate response and smaller trading volume around earnings announcement day will be found. However, there also will be less delayed response in stock returns since the earnings information is already diffused to the market. Therefore, the significant and robust evidence we found from delayed response in stock returns excludes the possibility that the effect of pre-announcement releases is confounded with the effect of the workweek system.

Firm heterogeneity can also account for the sluggish immediate stock response to earnings announcement. For instance, investors may expect that earnings news from large firms will have more ripple effect throughout the economy and they may have a greater response. If earnings announcements of large firms are concentrated on a specific day, more immediate response relative to other days will be observed. Similarly, if some earnings news is considered to be transitory and not sustainable in the future, investors will not respond to that news. However, these characteristics of firms cannot explain why less immediate responses are followed by more delayed responses later.

There can be other characteristics of firms such as conspicuousness. It would cause both less immediate response and more delayed response. These kinds of characteristics are difficult to observe, but are likely to be related to the size of the company. Even though we could not fully control salient features of each company, our estimated stock returns results are robust when including number of employees and market capitalization as control variables.

7. Conclusion

We found the strong relationship between work schedule of finance sector and investor response to Friday earnings announcements relative to non-Friday earnings announcements. Unlike Wall Street, financial sector in Korea maintained flat wage system until recently. This wage system can be one reason supporting our results. We also suggest that network effect could be one driving force behind Friday effect in financial sector. Further research should be followed to examine the introduction of incentive system on Friday effect.

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Figure 1A: The Trends of Monthly Working Days

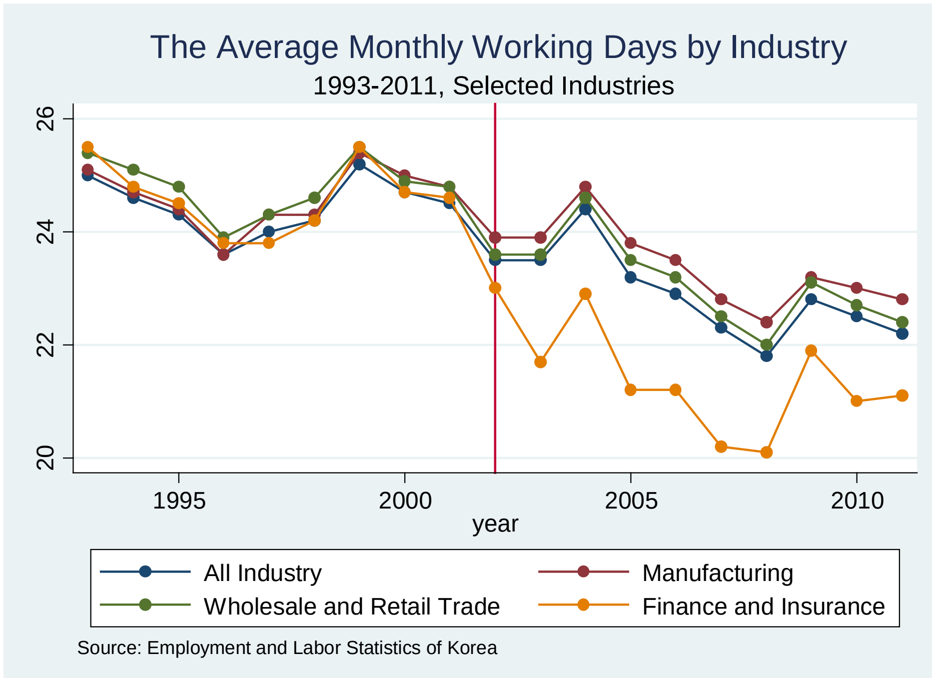

Figure 1B: The Trends of Monthly Working Hours

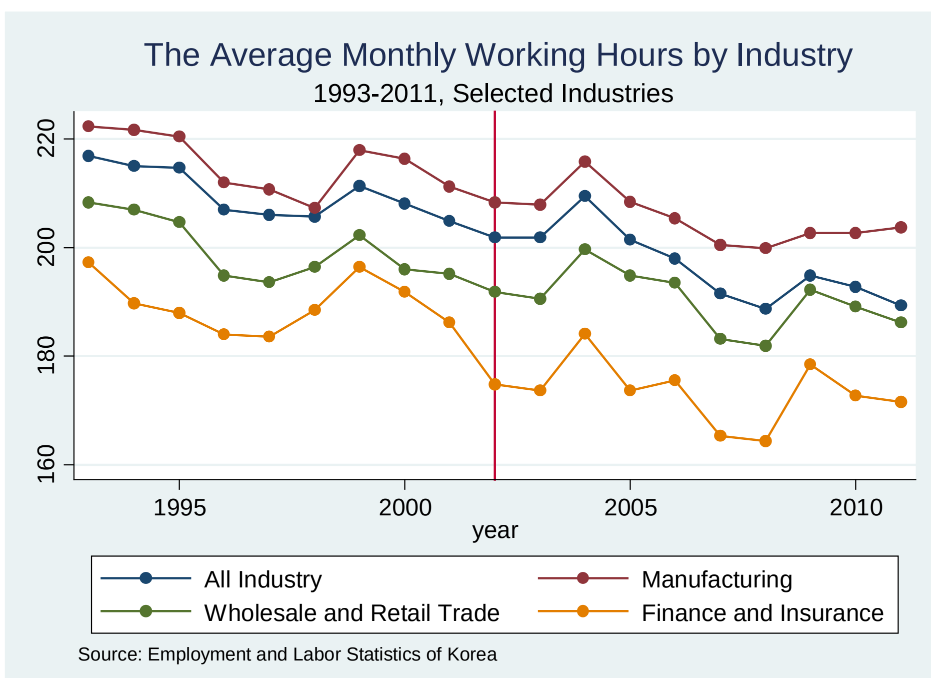

Figure 2 Comparisons of Firm Characteristics by Earning Surprise Quantiles

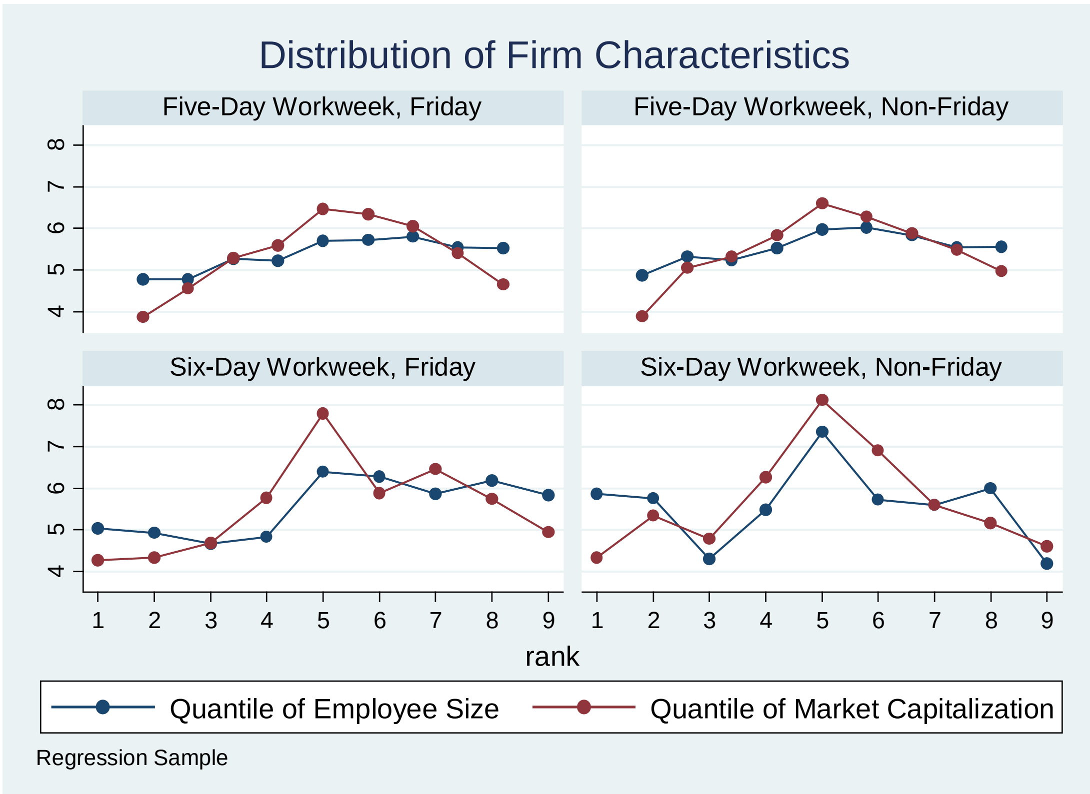

Table 1: Changes in Working Hours Regulation in Korea

1953	Establishment of the Labor Standard Act with standard working week of 48 hours.
1989	The Labor Standard Act was revised to standard working week of 44 hours.
1998	Labor hours Committee was formed to discuss reduction or standard working hours.
2000	In October, business-union-government agreed to gradual adoption of working week of 40 hours.
2002	In July, banking sector voluntarily initiated working week of 40 hours.
2002	In November, non-banking sector voluntarily started working week of 40 hours.
2003	In August, the National Assembly approved the legislation of working week of 40 hours which would be gradually implemented over years.
2004	In July, corporations with more than 1,000 workers, insurance firms and state-invested companies adopted working week of 40 hours.
2005	In July, corporations with more than 300 workers started working week of 40 hours.
2006	In July, corporations with more than 100 workers embarked working week of 40 hours.
2007	In July, corporations with more than 50 workers implemented working week of 40 hours.
2008	In July, corporations with more than 20 workers accepted working week of 40 hours.

Table 2 Distribution of Earnings Announcements

	All	Monday	Tuesday	Wed	Thu	Fri	Weekend
A. Whole Period							
Number	64,883	14,487	10,103	8,554	11,725	17,158	2,856
Fraction (%)	100	22.33	15.57	13.18	18.07	26.44	4.41
B. Six-day Workweek (2000.1~2002.11)							
Number	6,142	968	1,284	1,066	349	1,994	481
Fraction (%)	100	15.76	20.91	17.36	5.68	32.46	7.83
C. Five-day Workweek (2002.11~2011.12)							
Number	58,741	13,519	8,819	7,488	11,376	15,164	2,375
Fraction (%)	100	23.01	15.01	12.75	19.37	25.82	4.04
D. Our Sample							
Number	8,200	1,128	1,095	1,371	2,094	2,512	Excluded
Fraction (%)	100	13.76	13.35	16.72	25.54	30.63	0

Source: Bloomberg

Table 3 Comparison of Average Characteristics of Announcements

A. Under Six-day Workweek (2000.1-2002.11)			
	Non-Friday Announcements	Friday Announcements	Difference
Earnings Surprises	3.76	4.35	0.59***
(9 Quantiles)	(0.19)	(0.12)	(0.22)
The Number of Employees	5.63	5.40	-0.23
(10 Quantiles)	(0.27)	(0.13)	(0.30)
Market Capitalization	5.68	5.38	-0.30
(10 Quantiles)	(0.25)	(0.13)	(0.29)
Share of KSE Announcements	0.68	0.75	0.07
(KSE/KSE+KOSDAQ)	(0.04)	(0.02)	(0.05)
N	134	456	
B. Under Five-day Workweek (2002.11~2011.12)			
	Non-Fridays	Fridays	Difference
Earnings Surprises	4.81	4.60	-0.21***
(9 Quantiles)	(0.03)	(0.05)	(0.06)
The Number of Employees	5.56	5.33	-0.24***
(10 Quantiles)	(0.04)	(0.06)	(0.07)
Market Capitalization	5.55	5.32	-0.24***
(10 Quantiles)	(0.04)	(0.06)	(0.07)
Share of KSE Announcements	0.64	0.68	0.04***
(KSE/KSE+KOSDAQ)	(0.01)	(0.01)	(0.01)
N	5741	2207	

Sample: Our basic sample constructed for analysis in chapter 4. Standard errors are reported in parenthesis. (* significant at 10%,**significant at 5%, *** significant at 1

Table 4 Immediate Stock Responses to Earnings Announcements (Top 2 and Bottom 2 Quantiles)

Immediate Response $R_{q,k}^{0,1}$				
	(1)	(2)	(3)	(4)
Sample Periods	2000-2011		2000-2008	
$\widehat{\beta_1}$: Top 2 Quantiles	-0.012 (0.013)	-0.011 (0.013)	-0.008 (0.014)	-0.008 (0.015)
$\widehat{\beta_2}$: Friday	0.023* (0.013)	0.024* (0.014)	0.022 (0.013)	0.022 (0.014)
$\widehat{\beta_3}$: Five-Day Workweek	0.016 (0.016)	0.017 (0.017)	-0.018 (0.016)	0.012 (0.019)
$\widehat{\beta_4}$: Top 2 Quantiles $\times$ Friday	0.026** (0.013)	0.026** (0.013)	0.027** (0.013)	0.027** (0.014)
$\widehat{\beta_5}$: Five-Day Workweek$\times$ Friday	-0.018 (0.014)	-0.019 (0.014)	-0.012 (0.014)	-0.012 (0.014)
$\widehat{\beta_6}$: Top 2 Quantiles $\times$ Five $-$ Day Workweek	0.048*** (0.011)	0.047*** (0.012)	0.045*** (0.012)	0.046*** (0.012)
$\widehat{\beta_7}$: Top 2 Quantiles $\times$ Friday $\times$ Five $-$ Day Workweek	-0.034*** (0.013)	-0.034** (0.014)	-0.038*** (0.014)	-0.038*** (0.015)
Controls	X	X	X	X
Interacted Controls	X	X	X	X
Number of Announcements		X		X
Adjusted R^2	0.08	0.08	0.08	0.08
Sample Size	3313	3313	2225	2225

The standard set of control variables includes indicator of KSE/KOSDAQ, year× month dummy variables, decile of employee size, and market capitalization calculated within each quarter. Finally, standard errors are clustered by day of announcement to allow correlations of stock returns on the same day. Standard errors are reported in parenthesis († significant at 10%,*significant at 5%, ** significant at 1%)

Table 5 Delayed and Long Run Stock Responses to Earnings Announcements (Top and Bottom Quantiles)

Delayed Response $R_{q,k}^{2,55}$				
	(1)	(2)	(3)	(4)
Sample Period	2000-2011		2000-2008	
$\widehat{\beta_1}$: Top 2 Quantiles	0.109** (0.047)	0.120** (0.048)	0.106** (0.051)	0.113** (0.052)
$\widehat{\beta_4}$: Top 2 Quantiles× Friday	-0.062 (0.042)	-0.075* (0.042)	-0.066 (0.044)	-0.077* (0.044)
$\widehat{\beta_6}$: Top 2 Quantiles× Five − Day Workweek	-0.086** (0.040)	-0.010** (0.041)	-0.098** (0.043)	-0.109** (0.043)
$\widehat{\beta_7}$: Top 2 Quantiles× Friday × Five − Day Workweek	0.103** (0.045)	0.117** (0.046)	0.110** (0.050)*	0.121** (0.050)
Controls	X	X	X	X
Interacted Controls	X	X	X	X
Number of Announcements		X		X
Adjusted R^2	0.17	0.17	0.18	0.18
Sample Size	3286	3286	2169	2169
Long-Run Response $R_{q,k}^{0,55}$				
	(5)	(6)	(7)	(8)
Sample Period	2000-2011		2000-2008	
$\widehat{\beta_1}$: Top 2 Quantiles	0.090* (0.048)	0.102** (0.049)	0.091* (0.053)	0.097* (0.053)
$\widehat{\beta_4}$: Top 2 Quantiles× Friday	-0.038 (0.044)	-0.051 (0.044)	-0.042 (0.046)	-0.051 (0.046)
$\widehat{\beta_6}$: Top 2 Quantiles × Five − Day Workweek	-0.047 (0.042)	-0.060 (0.042)	-0.061 (0.045)	-0.071 (0.044)
$\widehat{\beta_7}$: Top 2 Quantiles× Friday × Five − Day Workweek	0.074 (0.048)	0.088* (0.048)	0.079 (0.053)	0.089* (0.052)
Controls	X	X	X	X
Interacted Controls	X	X	X	X
Number of Announcements		X		X
Adjusted R^2	0.17	0.17	0.18	0.18
Sample Size	3286	3286	2169	2169

(* significant at 10%,**significant at 5%, *** significant at 1%)

Table 6 Stock Responses to Earnings Announcements
(Using All Announcements)

Dependent Variable	Immediate Response	Delayed Response	Long-Run Response	Immediate Response	Delayed Response	Long-Run Response
	(1)	(2)	(3)	(4)	(5)	(6)
Sample Period	2000-2011			2000-2008		
$\widehat{\beta_1}$: Quantile	0.000 (0.002)	0.017** (0.007)	0.017** (0.007)	0.001 (0.002)	0.017** (0.008)	0.017** (0.007)
$\widehat{\beta_4}$: Quantile× Friday	0.003* (0.002)	-0.013** (0.006)	-0.010 (0.006)	0.003* (0.002)	-0.014** (0.007)	-0.011* (0.007)
$\widehat{\beta_6}$: Quantile× Five − Day Workweek	0.005*** (0.001)	-0.016*** (0.006)	-0.013** (0.006)	0.004*** (0.002)	-0.019*** (0.006)	-0.016** (0.006)
$\widehat{\beta_7}$: Quantile× Friday × Five − Day Workweek	-0.004** (0.002)	0.017*** (0.007)	0.015** (0.007)	-0.005*** (0.002)*	0.019*** (0.007)	0.016** (0.007)
Controls	X	X	X	X	X	X
Interacted Controls	X	X	X	X	X	X
Number of Announcements	X	X	X	X	X	X
R^2	0.06	0.14	0.14	0.06	0.15	0.15
Sample Size	8200	7862	7862	5537	5204	5204

(* significant at 10%,**significant at 5%, *** significant at 1%)

Table 7 Trading Volume Responses to Earnings Announcements
(Using All Announcements)

Dependent Variable	Number of Stocks Traded			Value of Stocks Traded		
Sample Period	2000-2011	2000-2011	Pre-crisis	2000-2011	2000-2011	Pre-crisis
	(1)	(2)	(3)	(4)	(5)	(6)
$\widehat{\beta_1}$: Friday	0.120* (0.065)	0.134** (0.065)	0.131** (0.067)	0.125* (0.065)	0.139** (0.065)	0.134** (0.066)
$\widehat{\beta_2}$: Five-Day Workweek	1.610*** (0.118)	1.501*** (0.135)	0.722 (0.172)	1.609*** (0.120)	1.487*** (0.141)	0.718*** (0.174)
$\widehat{\beta_3}$: Friday $\times$ Five $-$ Day Workweek	-0.139** (0.068)	-0.157** (0.068)	-0.150** (0.072)	-0.140** (0.069)	-0.157** (0.069)	-0.141** (0.072)
Controls	yes	yes	yes	yes	yes	yes
Interacted Controls	yes	yes	yes	yes	yes	yes
Number of Announcements		yes	yes		yes	yes
Company Fixed Effect	yes	yes	yes	yes	yes	yes
R^2	0.18	0.18	0.22	0.15	0.15	0.18
Sample Size	8166	8166	5503	8166	8166	5503

(* significant at 10%,**significant at 5%, *** significant at 1%)