

## Internet Appendix for

### Publicizing Arbitrage: Impact of Mandatory Disclosures

#### Appendix IA.A. Explanation of TAQ Data Processing and Construction of High-Frequency Measures of Informational Efficiency

This section explains the method used to process TAQ data and construct the high-frequency measures of informational efficiency. We first process all trades and quotes in the TAQ database from January 1, 2003 to December 31, 2012, excluding 2008. We follow Hasbrouck (1993) and exclude overnight returns. We focus solely on trades and quotes within regular trading hours, that is, between 9:30 am and 4:00 pm Eastern Time. For the processing of the trade files, we follow Boehmer and Wu (2013) and remove trades with non-positive prices or sizes. Furthermore, we require that TAQ's CORR file to equal zero, and TAQ's COND field is either blank or equal to \*, B, E, J, or K. We also follow Boehmer and Wu (2013) and remove trades with a price greater than 150% or less than 50% of the price of the previous trade. For the processing of the quote files, we remove quotes with non-positive bid or ask prices or where the bid price is strictly higher than the ask price—that is, we remove cases of locked and crossed markets. We require that TAQ's mode field is equal to 1, 2, 3, 6, 10, 12, 15, 19, 20, 27, or 28. We also follow Boehmer and Wu (2013) and require that quotes with an ask price that is greater than 150% of the bid price are excluded. For each stock, we aggregate all trades during the same second that execute at the same price, and retain only the last quote for each second, in the case that multiple quotes are reported. To combine the quote and trade file, we use the Lee and Ready's (1991) method for assigning trade directions. That is, we denote the trade as “buyer-initiated” if the trade price is greater than the prevailing mid-quote, and we denote the trade as “seller-initiated” if the trade price is less than the prevailing mid-quote.

To calculate the Variance Ratio, we first generate 1-minute and 30-minute returns for each stock in each trading day. As is customary in the market microstructure literature, we use the quote mid-point as opposed to the trade price in calculating returns. We then take the variance of all 30-minute and 1-minute returns for each stock each trading day and compute the variance ratio as follows:

$$VARRATIO = \left| 1 - \frac{var(30min)}{30 \times var(1min)} \right|$$

To calculate the Pricing Error, we follow Hasbrouck (1993) and Boehmer and Wu (2013), and decompose log transaction prices,  $p_t$ , as follows:

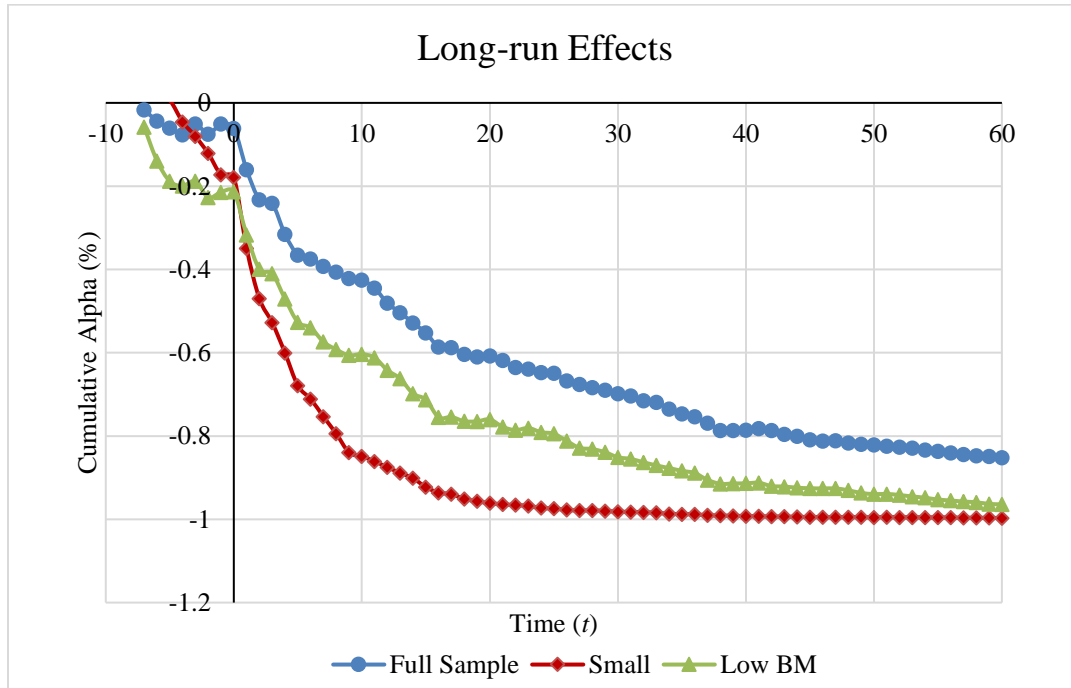
$$p_t = m_t + s_t$$

In the equation above,  $m_t$  represents the efficient (random walk) component of the stock price. It is the expectation of the stock's fundamental value.  $m_t$  changes in response to new public information.  $s_t$  represents the pricing error, and measures temporary deviations relative to  $m_t$ . It is assumed to follow a zero-mean covariance-stationary process, however, it can be serially correlated or correlated with the innovations from  $m_t$ . The standard deviation of the pricing error,  $\sigma(s)$  measures the magnitude of deviations from the efficient price and can be interpreted as a measure of informational efficiency.

To empirically estimate this model, we follow Boehmer and Wu (2013) and run a vector autoregression (VAR) system for each stock each trading day, using five lags over the following jointly determined system of variables,  $\{r_t, x_t\}$ , where  $r_t$  is the difference in log prices,  $p_t$ , and  $x_t$  is a vector representing trade-related variables such as, trade sign indicator—a variable which equals 1 for a buy and -1 for a sale, signed trading volume, and signed square root of trading volume. Estimating this system of equations using a VAR yields estimates of  $\sigma(s)$  for each stock each trading day. We scale  $\sigma(s)$  by the standard deviation of log transaction prices,  $\sigma(p)$ , to compute the pricing error,  $PE$ . Finally, to reduce the influence of outliers, we follow Boehmer and Wu (2013) and remove observations where  $\sigma(s) > \sigma(p)$ .

### Figure IA.1. Market Reactions to Short Interest Announcements: Long-run Effects

This figure presents the long-run price reactions to short interest announcements. On each announcement date, we form 10 portfolios based on  $\Delta SHORT$ , which is the change in short interest between two successive short interest announcements, scaled by stock's shares outstanding. This figure shows the cumulative 4-factor alphas (in %), starting from 7 trading days prior to the short-interest announcements until 60 trading days after the short-interest announcements. Short interest is publicly disclosed after 4:00 p.m. at  $t = 0$ . The blue line shows cumulative 4-factor alphas for the *Increased Shorting* portfolio in the full sample. The grey and red lines show the cumulative 4-factor alphas for *Increased Shorting* portfolio within *Small* (stocks with market capitalization in bottom quintile) and *LowBM* (stocks with book-to-market ratios in bottom quintile), respectively.



**Table IA.1. Price Reactions to Earnings Announcements and Aggregate Uncertainty**

This table presents the regression results for the short-term price reactions to earnings announcements controlling for financial crisis and aggregate uncertainty. The dependent variable,  $CAR[0,1]$ , is the absolute value of 2-day cumulative abnormal return in the  $[0,1]$  days around the earnings announcement, defined as the difference between buy-and-hold returns of the stock and beta multiplied by the buy-and-hold return of the market.  $POST$  is a dummy variable that equals 1 for the firm's earnings announcement dates after September 7, 2007;  $e$  is a dummy variable that equals 1 when the firm's earnings announcement occurs after the end-of-month  $REPDATE$  and before the mid-month  $REPDATE$  the following month;  $POST \times e$  is an interaction term between  $POST$  and  $e$ .  $CRISIS$  is a dummy variable that equals 1 for the period covering from September 2007 to December 2009;  $VIX$  is the average of daily CBOE Volatility Index in a given month. From column 1 to 5, we include  $NUMEST$ ,  $IO$ ,  $FE$ ,  $EARNINGS\_PERSIST$ ,  $EARNINGS\_VOL$ ,  $NUMANN$  and industry fixed effects. Column 1-3 have month-of-year (e.g., January, February) and day-of-week (e.g., Monday, Tuesday) fixed effects. Column 4 adds year fixed effects; column 5 extends the empirical model by including stock fixed effects. Variables are defined in Appendix A. All regressions include a constant term, whose coefficient is suppressed for reporting purposes. We present ordinary least squares estimates with standard errors double-clustered by stock and earnings announcement day; \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

<i>VARIABLES</i>	1 <i>CAR[0,1]</i>	2 <i>CAR[0,1]</i>	3 <i>CAR[0,1]</i>	4 <i>CAR[0,1]</i>	5 <i>CAR[0,1]</i>
<i>POST x e</i>	-0.0022*** (0.0007)	-0.0022*** (0.0007)	-0.0024*** (0.0007)	-0.0022*** (0.0007)	-0.0020*** (0.0007)
<i>POST</i>	0.0046*** (0.0006)	0.0019* (0.0010)	0.0006 (0.0006)	-0.0001 (0.0029)	0.0017 (0.0029)
<i>e</i>	0.0033*** (0.0005)	0.0033*** (0.0005)	0.0034*** (0.0005)	0.0033*** (0.0005)	0.0027*** (0.0005)
<i>NUMEST</i>	-0.0052*** (0.0003)	-0.0051*** (0.0003)	-0.0051*** (0.0003)	-0.0051*** (0.0003)	-0.0016*** (0.0005)
<i>IO</i>	0.0000*** (0.0000)	0.0000*** (0.0000)	0.0001*** (0.0000)	0.0000*** (0.0000)	0.0000 (0.0000)
<i>FE</i>	0.1654*** (0.0131)	0.1574*** (0.0130)	0.1521*** (0.0130)	0.1530*** (0.0131)	0.0929*** (0.0132)
<i>EARNINGS_PERSIST</i>	0.0032*** (0.0006)	0.0032*** (0.0006)	0.0032*** (0.0006)	0.0032*** (0.0006)	0.0034*** (0.0008)
<i>EARNINGS_VOL</i>	0.0004** (0.0002)	0.0005*** (0.0002)	0.0005*** (0.0002)	0.0005*** (0.0002)	0.0017*** (0.0003)
<i>NUMANN</i>	-0.0014*** (0.0003)	-0.0014*** (0.0003)	-0.0014*** (0.0003)	-0.0014*** (0.0003)	-0.0015*** (0.0003)
<i>CRISIS</i>		0.0103*** (0.0006)	0.0083*** (0.0007)	0.0100*** (0.0025)	0.0078*** (0.0025)
<i>VIX</i>			0.0003*** (0.0000)	0.0003*** (0.0000)	0.0003*** (0.0000)
Observations	59,020	59,020	59,020	59,020	59,020
R-squared	0.117	0.121	0.122	0.122	0.064
Year FE	No	No	No	Yes	Yes
Month-of-year FE	Yes	Yes	Yes	Yes	Yes
Day-of-week FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Stock FE	No	No	No	No	Yes

**Table IA.2. Number of Days since the Last Short Interest Announcement**

This table presents the analysis examining the determinants of *DAYSSINCE*, which is the number of trading days between an earnings announcement and the most recent short interest announcement prior to it. For earnings announcement that take place after the (placebo) end-of-month short interest announcement date in the pre-amendment period, *DAYSSINCE* is defined using the placebo *REPDATE*. Panel A reports the summary statistics for *DAYSSINCE*; Panel B provides the regression analysis. All variables are defined as in Table 2 (with definitions in Appendix A). In columns 2 to 3, we control for *NUMEST*, *IO*, *FE*, *EARNINGS\_PERSIST*, *EARNINGS\_VOL*, *NUMANN* and include industry, time (year, month-of-year and day-of-week) fixed effects. In column 3, we also include stock fixed effects. All regressions include a constant term, whose coefficient is suppressed for reporting purposes. We present ordinary least squares estimates with standard errors double-clustered by stock and earnings announcement day; \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

**Panel A. Summary Statistics**

	P25	Mean	Median	P75	Standard Deviation
<i>POST=0 &amp; e=0</i>	3	5.4030	6	8	3.2040
<i>POST=0 &amp; e=1</i>	3	5.5828	6	9	3.2998
<i>POST=1 &amp; e=0</i>	3	5.8669	6	9	3.4522
<i>POST=1 &amp; e=1</i>	3	5.6307	6	8	3.3134

**Panel B. Regression Analysis**

<i>VARIABLES</i>	1 <i>DAYSSINCE</i>	2 <i>DAYSSINCE</i>	3 <i>DAYSSINCE</i>
<i>POST x e</i>	-0.4160 (0.4339)	-0.6393 (0.4430)	-0.8278 (0.5436)
<i>POST</i>	0.4639 (0.3701)	-0.2633 (0.7808)	-0.1618 (0.1147)
<i>e</i>	0.1798 (0.3006)	-0.0857 (0.3243)	-0.1153 (0.3985)
<i>NUMEST</i>		-0.0604 (0.0390)	-0.0564 (0.0381)
<i>IO</i>		0.0041* (0.0023)	0.0007 (0.0012)
<i>FE</i>		-0.4393 (1.0045)	-0.5140 (0.8734)
<i>EARNINGS_PERSISTENCE</i>		0.0636 (0.0641)	0.0236 (0.0652)
<i>EARNINGS_VOL</i>		-0.0002 (0.0198)	-0.0412* (0.0219)
<i>NUMANN</i>		0.0891 (0.1302)	0.1597*** (0.0276)
Observations	79,561	59,934	59,934
R-squared	0.002	0.115	0.086
Time FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Stock FE	No	No	Yes

**Table IA.3. Robustness Test: Using SMB-adjusted returns**

This table presents the regression results for the short-term and long-term price reactions to earnings announcements using SMB-adjusted returns.  $CAR[0,1]$  is the absolute value of 2-day cumulative abnormal return in the  $[0,1]$  days around the earnings announcement, defined as the difference between buy-and-hold returns of the stock and that of a size and book-to-market matched portfolio.  $CAR[2,61]$  is the absolute value of 60-day cumulative abnormal return in the  $[2,61]$  days after the earnings announcement, defined as the difference between buy-and-hold returns of the stock and that of a size and book-to-market matched portfolio. All other variables are defined as in Table 2. All regressions include a constant term, whose coefficient is suppressed for reporting purposes. We present ordinary least squares estimates with standard errors double-clustered by stock and earnings announcement day; \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

VARIABLES	1 $CAR[0,1]$	2 $CAR[0,1]$	3 $CAR[0,1]$	4 $CAR[0,1]$	5 $CAR[2,61]$	6 $CAR[2,61]$	7 $CAR[2,61]$	8 $CAR[2,61]$
$POST \times e$	-0.0028*** (0.0010)	-0.0021** (0.0010)	-0.0019** (0.0010)	-0.0017** (0.0007)	-0.0063** (0.0025)	-0.0075*** (0.0025)	-0.0071*** (0.0025)	-0.0060** (0.0026)
$POST$	0.0125*** (0.0018)	0.0120*** (0.0019)	0.0121*** (0.0019)	0.0119*** (0.0013)	0.0274*** (0.0038)	0.0239*** (0.0042)	0.0239*** (0.0042)	0.0228*** (0.0040)
$e$	0.0032*** (0.0007)	0.0027*** (0.0006)	0.0034*** (0.0007)	0.0027*** (0.0005)	0.0001 (0.0018)	0.0031* (0.0016)	0.0041** (0.0017)	0.0040** (0.0018)
Observations	78,327	59,026	59,026	59,026	74,734	56,609	56,609	56,609
R-squared	0.071	0.119	0.119	0.062	0.027	0.073	0.073	0.031
Controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Stock FE	No	No	No	Yes	No	No	No	Yes

**Table IA.4. Robustness Test: Control for Market Reactions to 8-K Filings**

This table presents the results of the robustness tests whereby we include market reactions to firms' 8-K filings as a control variable in main regressions on price efficiency. For each firm, we take all 8-K filings reported between two consecutive *REPDATE*s prior to the earnings announcement plus the filings since the last *REPDATE* before the earnings announcement date. We then calculate the absolute value of the average 2-day abnormal returns realized after all these 8-K filings and label it *8K\_ABRETURNS*. For observations that are after the (placebo) end-of-month short interest announcement date in the pre-amendment period, *8K\_ABRETURNS* is defined using the placebo *REPDATE*. Abnormal returns are calculated in the same way as *CAR*[0,1]. The dependent variables are *CAR*[0,1], *TURNOVER*, *SPREAD*, *VOLATILITY*, and *CAR*[2,61]. *CAR*[0,1] and *CAR*[2,61] are defined as the difference between buy-and-hold returns of the stock and beta multiplied by the buy-and-hold return of the market. *POST* is a dummy variable that equals 1 for the firm's earnings announcement dates after September 7, 2007; *e* is a dummy variable that equals 1 when the firm's earnings announcement occurs after the end-of-month *REPDATE* and before the mid-month *REPDATE* the following month; *POST* x *e* is an interaction term between *POST* and *e*. Control variables are *NUMEST*, *IO*, *FE*, *EARNINGS\_PERSIST*, *EARNINGS\_VOL*, *NUMANN*, and industry, time (year, month-of-year, day-of-week) and stock fixed effects. Variables are defined in Appendix A. We include a constant term in all regression specifications but suppress it for reporting purposes. We present ordinary least squares estimates with standard errors double-clustered by stock and earnings announcement day; \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

<i>VARIABLES</i>	1 <i>CAR</i> [0,1]	2 <i>TURNOVER</i>	3 <i>SPREAD</i>	4 <i>VOLATILITY</i>	5 <i>CAR</i> [2,61]
<i>POST</i> x <i>e</i>	-0.0027*** (0.0009)	-0.0008** (0.0003)	-0.0147** (0.0064)	-0.0180** (0.0079)	-0.0085*** (0.0029)
<i>POST</i>	0.0136*** (0.0016)	0.0010 (0.0006)	0.1105*** (0.0107)	-0.0144 (0.0131)	0.0280*** (0.0045)
<i>e</i>	0.0032*** (0.0006)	0.0004 (0.0003)	0.0108** (0.0048)	0.0049 (0.0059)	0.0065*** (0.0020)
<i>8K_ABRETURNS</i>	-0.0343*** (0.0130)	-0.0253*** (0.0061)	-0.2069*** (0.0634)	-0.3603*** (0.0689)	-0.0722** (0.0293)
Observations	44,396	45,109	45,087	44,787	43,336
R-squared	0.050	0.077	0.108	0.018	0.021
Controls	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes

**Table IA.5. Robustness Test: Control for Aggregate Short Interest**

This table presents the results of the robustness tests whereby we include aggregate short interest as a control variable in main regressions on price efficiency. Following Lamont and Stein (2004), we define *AGGSHORT*, which is the value-weighted average of stock short interest (total number of shares shorted in a given stock divided by the stock's total shares outstanding). *AGGSHORT* is measured as of the last short interest announcement date prior to the stock's earnings announcement. In the pre period, since there is only mid-month short interest announcement, for observations after the placebo end-of-month announcement, we use *AGGSHORT* as of the last mid-month short interest announcement. The dependent variables are *CAR*[0,1], *TURNOVER*, *SPREAD*, *VOLATILITY*, and *CAR*[2,61]. *CAR*[0,1] and *CAR*[2,61] are defined as the difference between buy-and-hold returns of the stock and beta multiplied by the buy-and-hold return of the market. *POST* is a dummy variable that equals 1 for the firm's earnings announcement dates after September 7, 2007; *e* is a dummy variable that equals 1 when the firm's earnings announcement occurs after the end-of-month *REPDATE* and before the mid-month *REPDATE* the following month; *POST* x *e* is an interaction term between *POST* and *e*. Control variables are *NUMEST*, *IO*, *FE*, *EARNINGS\_PERSIST*, *EARNINGS\_VOL*, *NUMANN*, and industry, time (year, month-of-year, day-of-week) and stock fixed effects. Variables are defined in Appendix A. We include a constant term in all regression specifications but suppress it for reporting purposes. We present ordinary least squares estimates with standard errors double-clustered by stock and earnings announcement day; \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

<i>VARIABLES</i>	1 <i>CAR</i> [0,1]	2 <i>TURNOVER</i>	3 <i>SPREAD</i>	4 <i>VOLATILITY</i>	5 <i>CAR</i> [2,61]
<i>POST</i> x <i>e</i>	-0.0020*** (0.0007)	-0.0010*** (0.0003)	-0.0119** (0.0057)	-0.0202*** (0.0066)	-0.0064** (0.0027)
<i>POST</i>	0.0123*** (0.0014)	0.0010* (0.0005)	0.1084*** (0.0097)	-0.0053 (0.0115)	0.0300*** (0.0042)
<i>e</i>	0.0024*** (0.0005)	0.0008*** (0.0002)	0.0034 (0.0045)	0.0123** (0.0049)	0.0022 (0.0019)
<i>AGGSHORT</i>	-0.0618* (0.0358)	-0.0246* (0.0143)	-0.5157* (0.2731)	-0.5942* (0.3184)	-0.2374* (0.1233)
Observations	59,020	59,934	59,904	59,425	56,609
R-squared	0.063	0.082	0.132	0.022	0.029
Time FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes

**Table IA.6. Robustness: Alternative Sample Periods**

This table presents the main regression results on price efficiency using alternative sample periods. In Panel A, we present the regression results using a [-48,48] month event window around the regulatory amendments on September 7, 2007, excluding 2008. In Panel B, we present the regression results using a [-48,60] month event window around the regulatory amendments on September 7, 2007, excluding 2008. The dependent variables are *CAR*[0,1], *TURNOVER*, *SPREAD*, *VOLATILITY*, and *CAR*[2,61]. *CAR*[0,1] and *CAR*[2,61] are defined as the difference between buy-and-hold returns of the stock and beta multiplied by the buy-and-hold return of the market. *POST* is a dummy variable that equals 1 for the firm's earnings announcement dates after September 7, 2007; *e* is a dummy variable that equals 1 when the firm's earnings announcement occurs after the end-of-month *REPDATE* and before the mid-month *REPDATE* the following month; *POST* x *e* is an interaction term between *POST* and *e*. Control variables are *NUMEST*, *IO*, *FE*, *EARNINGS\_PERSIST*, *EARNINGS\_VOL*, *NUMANN*. We include industry, time (year, month-of-year and day-of-week) and stock fixed effects. Variables are defined in Appendix A. We include a constant term in all regression specifications but suppress it for reporting purposes. We present ordinary least squares estimates with standard errors double-clustered by stock and earnings announcement day; \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

**Panel A. [-48,48] Month Event Window Around the Regulatory Amendments (Excluding 2008)**

VARIABLES	1 <i>CAR</i> [0,1]	2 <i>TURNOVER</i>	3 <i>SPREAD</i>	4 <i>VOLATILITY</i>	5 <i>CAR</i> [2,61]
<i>POST</i> x <i>e</i>	-0.0027*** (0.0008)	-0.0012*** (0.0003)	-0.0139** (0.0057)	-0.0193*** (0.0073)	-0.0078*** (0.0029)
<i>POST</i>	0.0125*** (0.0014)	0.0011** (0.0005)	0.0887*** (0.0096)	-0.0132 (0.0119)	0.0264*** (0.0042)
<i>e</i>	0.0030*** (0.0006)	0.0009*** (0.0002)	0.0097** (0.0040)	0.0122** (0.0052)	0.0061*** (0.0018)
Observations	47,687	48,436	48,425	48,055	46,747
R-squared	0.063	0.076	0.070	0.022	0.023
Controls	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes

**Panel B. [-48,60] Month Event Window Around the Regulatory Amendments (Excluding 2008)**

VARIABLES	1 <i>CAR</i> [0,1]	2 <i>TURNOVER</i>	3 <i>SPREAD</i>	4 <i>VOLATILITY</i>	5 <i>CAR</i> [2,61]
<i>POST</i> x <i>e</i>	-0.0023*** (0.0008)	-0.0012*** (0.0003)	-0.0108* (0.0063)	-0.0221*** (0.0070)	-0.0062** (0.0029)
<i>POST</i>	0.0120*** (0.0014)	0.0008 (0.0005)	0.1233*** (0.0100)	-0.0121 (0.0116)	0.0282*** (0.0042)
<i>e</i>	0.0024*** (0.0005)	0.0008*** (0.0002)	0.0034 (0.0047)	0.0152*** (0.0047)	0.0036* (0.0019)
Observations	54,912	55,814	55,778	55,423	53,973
R-squared	0.061	0.083	0.190	0.019	0.030
Controls	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes



**Table IA.7. Reward-to-Risk Ratios of Short Sellers' Positions, All Deciles**

This table reproduces Table 9 for all decile portfolios along with portfolio alphas and standard errors. It shows the impact of the regulatory amendments on the reward-to-risk ratio of short-sellers' position changes, using the IHS Markit data starting from July 2006. Starting from July 2006, IHS Markit reports the daily total short positions taken on by the universe of market participants that it covers. On each *REPDATE* (including the placebo one), for each stock, we first calculate the change in short interest (in IHS Markit) from previous *REPDATE*. Short interest is the daily total short positions in a given stock divided by the stock's shares outstanding. Based on changes in short interest, we form 10 portfolios and hold these portfolios until the next *REPDATE* (approximately 15 calendar days). We then pool the daily portfolio returns pertaining to each four cases –  $POST=0$  and  $e=0$ ,  $POST=0$  and  $e=1$ ,  $POST=1$  and  $e=0$ , and  $POST=1$  and  $e=1$  – and run the 4-factor model for each  $POST$  and  $e$  using the time-series of portfolio returns. From this procedure, we estimate the 4-factor alphas along with its standard errors (specifically, Newey-West standard errors with 5 lags). Reward-to-risk ratios is defined as the 4-factor alpha divided by its standard error. The bottom decile portfolio (*P1*) has a  $\Delta SHORT$  below the 10<sup>th</sup> percentile, and the top decile portfolio (*P10*) has a  $\Delta SHORT$  above the 90<sup>th</sup> percentile; *P1-P10* is the spread between the two portfolios.

$e=0$					$e=1$				
		Alpha	Std Error	Ratio			Alpha	Std Error	Ratio
$POST=0$	P1	0.0083	0.0070	1.1857	P1	0.0062	0.0050	1.2400	
	P2	0.0039	0.0033	1.1818	P2	0.0028	0.0041	0.6829	
	P3	0.0021	0.0029	0.7241	P3	-0.0008	0.0015	-0.5333	
	P4	-0.0009	0.0015	-0.6000	P4	0.0010	0.0034	0.2941	
	P5	0.0022	0.0044	0.5000	P5	0.0006	0.0009	0.6667	
	P6	-0.0004	0.0027	-0.1481	P6	-0.0001	0.0004	-0.2500	
	P7	0.0001	0.0008	0.1250	P7	0.0034	0.0086	0.3953	
	P8	-0.0052	0.0061	-0.8525	P8	-0.0013	0.0022	-0.5909	
	P9	-0.0135	0.0083	-1.6265	P9	-0.0117	0.0071	-1.6479	
	P10	-0.0251	0.0126	-1.9921	P10	-0.0104	0.0065	-1.6000	
	P1-P10	0.0334	0.0181	1.8453	P1-P10	0.0166	0.0108	1.5370	
		Alpha	Std Error	Ratio			Alpha	Std Error	Ratio
$POST=1$	P1	0.0089	0.0072	1.2361	P1	0.0094	0.0078	1.2051	
	P2	0.0054	0.0036	1.5000	P2	0.0037	0.0026	1.4231	
	P3	0.0018	0.0021	0.8571	P3	0.0024	0.0022	1.0909	
	P4	0.0001	0.0001	0.6250	P4	-0.0009	0.0022	-0.4091	
	P5	-0.0007	0.0011	-0.6364	P5	0.0010	0.0023	0.4348	
	P6	0.0003	0.0016	0.1875	P6	-0.0006	0.0014	-0.4286	
	P7	-0.0008	0.0023	-0.3478	P7	-0.0007	0.0021	-0.3333	
	P8	-0.0092	0.0087	-1.0575	P8	-0.0080	0.0075	-1.0667	
	P9	-0.0175	0.0104	-1.6811	P9	-0.0192	0.0111	-1.7297	
	P10	-0.0214	0.0105	-2.0381	P10	-0.0257	0.0105	-2.4476	
	P1-P10	0.0303	0.0145	2.0897	P1-P10	0.0351	0.0141	2.4894	

**Table IA.8. Market Reactions to Short Interest Announcements**

This table presents the market reactions to short interest announcements during our sample period. We form 10 portfolios based on changes to short interest ( $\Delta SHORT$ ) on each announcement date.  $\Delta SHORT$  is the change in short interest between two successive short interest announcements, scaled by stock's shares outstanding. Decile 1 has a  $\Delta SHORT$  below the 10<sup>th</sup> percentile, and the Decile 10 has a  $\Delta SHORT$  above the 90<sup>th</sup> percentile. In Panel A, we report the average equal-weighted 2-day abnormal portfolio returns (in %) in the [1,2] days after the short interest announcement. We skip the day of announcement because short interest is disclosed after 4:00 p.m. In column 1, we report size and book-to-market adjusted abnormal returns; in columns 2 and 3, we present 3-factor and 4-factor alphas respectively. In Panel B, we report the average 2-day 4-factor alphas after the short interest announcement in the pre- and post-amendment periods; in Panel C, 4-factor alphas are reported separately for the mid- and end-of-month announcements in the post period. Panel C focuses on the post period because end-of-month announcements occur only in the post period. Alphas are estimated using the time-series of portfolio returns and we report Newey-West standard errors with 5 lags. \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

Full Sample						
Decile	SMB		3-factor Alpha		4-factor Alpha	
	Mean	StdErr	Mean	StdErr	Mean	StdErr
1	0.0432***	0.0137	0.0479***	0.0124	0.0477***	0.0125
2	0.0209*	0.0123	0.0340***	0.0115	0.0341***	0.0114
3	0.0155	0.0172	0.0378**	0.0180	0.0389**	0.0182
4	0.0102	-0.0075	0.0069	0.0226	0.0100	0.0228
5	0.0104	-0.0065	0.0177	0.0173	0.0209	0.0170
6	-0.0264*	0.0153	0.0265	0.0182	0.0252	0.0182
7	-0.0240**	0.0108	0.0059	0.0252	0.0015	0.0236
8	-0.0357*	0.0187	-0.0068	0.0212	-0.0105	0.0197
9	-0.0304**	0.0145	-0.0196	0.0137	-0.0222*	0.0127
10	-0.1060***	0.0188	-0.1008***	0.0160	-0.1031***	0.0155
1-10	0.1492***	0.0172	0.1487***	0.0171	0.1508***	0.0166
Pre- vs Post-amendment Periods						
Decile	POST=0		POST =1		Diff	
	Mean	StdErr	Mean	StdErr	Mean	StdErr
1	0.0171	-0.0201	0.0534***	-0.0157	0.0363**	0.0251
2	0.0096	0.0179	0.0399***	0.0136	0.0303	0.0224
3	0.0080	0.0230	0.0330	0.0244	0.0250	0.0339
4	0.0072	0.0250	0.0114	0.0306	0.0042	0.0222
5	0.0177	0.0187	0.0205	0.0225	0.0027	0.0310
6	0.0041	0.0243	0.0327	0.0256	0.0286	0.0330
7	-0.0052	0.0170	0.0081	0.0348	0.0133	0.0382
8	-0.0101	0.0170	-0.0103	0.0289	-0.0002	0.0342
9	-0.0247*	0.0145	-0.0209	0.0183	0.0038	0.0235
10	-0.0654**	-0.0286	-0.1275***	-0.0178	-0.0621***	0.0334
1-10	0.0825***	-0.0277	0.1809***	-0.0185	0.0984***	-0.0302

**Mid-month vs End-of-month Announcements in Post Period**

Decile	POST=1 & e=0		POST=1 & e=1		Diff	
	Mean	StdErr	Mean	StdErr	Mean	StdErr
1	0.0473**	0.0218	0.0608**	0.0248	0.0135	0.0286
2	0.0312	0.0244	0.0503***	0.0159	0.0191	0.0238
3	0.0357	0.0399	0.0296	0.0264	-0.0061	0.0301
4	0.0217	0.0497	0.0012	0.0439	-0.0205	0.0463
5	0.0324	0.0300	0.0103	0.0331	-0.0221	0.0256
6	0.0360	0.0459	0.0321	0.0433	-0.0039	0.0470
7	0.0094	0.0525	0.0073	0.0573	-0.0021	0.0501
8	-0.0163	0.0338	-0.0049	0.0514	0.0115	0.0297
9	-0.0182	0.0194	-0.0234	0.0316	-0.0052	0.0184
10	-0.1324***	0.0228	-0.1198***	0.0279	0.0126	0.0426
1-10	0.1797***	0.028655	0.1806***	0.026126	0.0009	0.0332

**Table IA.9. Abnormal Returns Prior to Short Interest Announcements**

This table presents abnormal returns 2-days prior to short interest announcements during our sample period. We form 10 portfolios based on changes to short interest ( $\Delta SHORT$ ) on each announcement date.  $\Delta SHORT$  is the change in short interest between two successive short interest announcements, scaled by stock's shares outstanding. Decile 1 has a  $\Delta SHORT$  below the 10<sup>th</sup> percentile, and the Decile 10 has a  $\Delta SHORT$  above the 90<sup>th</sup> percentile. In Panel A, we report the average equal-weighted abnormal returns (in %) 2 days before the short interest announcement, namely [-1,0]. We include the day of announcement because short interest is disclosed after 4:00 p.m. In column 1, we report size and book-to-market adjusted abnormal returns; in columns 2 and 3, we present 3-factor and 4-factor alphas respectively. In Panel B, we report the average 2-day 4-factor alphas prior the short interest announcement in the pre- and post-amendment periods; in Panel C, 4-factor alphas are reported separately for the mid- and end-of-month announcements in the post period. Panel C focuses on the post period because end-of-month announcements occur only in the post period. Alphas are estimated using the time-series of portfolio returns and we report Newey-West standard errors with 5 lags. \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

<b>Full Sample</b>						
	<b>SMB</b>		<b>3-factor Alpha</b>		<b>4-factor Alpha</b>	
Decile	Mean	StdErr	Mean	StdErr	Mean	StdErr
1	-0.0254	0.3165	0.0057	0.0240	-0.0086	0.0219
2	-0.0423	0.2915	-0.0257	0.0225	-0.0172	0.0221
3	-0.0425	0.3175	-0.0194	0.0346	-0.0123	0.0317
4	-0.0397	0.4239	0.0033	0.0472	0.0001	0.0388
5	-0.0499	0.4869	0.0136	0.0284	-0.0162	0.0282
6	-0.0465	0.5483	0.0280	0.0281	-0.0055	0.0273
7	-0.0125	0.5377	0.0545	0.0396	0.0253	0.0374
8	-0.0114	0.4524	0.0458	0.0382	0.0322	0.0334
9	-0.0044	0.3097	0.0279	0.0222	0.0214	0.0243
10	-0.0185	0.3059	0.0007	0.0235	0.0144	0.0243
1-10	-0.0069	0.2242	0.0002	0.0223	0.0230	0.0239
<b>Pre- vs Post-amendment Periods</b>						
	<b>POST=0</b>		<b>POST =1</b>		<b>Diff</b>	
Decile	Mean	StdErr	Mean	StdErr	Mean	StdErr
1	-0.0510	0.0370	0.0229	0.0394	0.0739	0.0480
2	-0.0460	0.0330	-0.0333	0.0371	0.0127	0.0446
3	-0.0296	0.0541	-0.0160	0.0505	0.0136	0.0621
4	-0.0330	0.0687	0.0239	0.0716	0.0569	0.0744
5	-0.0900	0.0701	0.0316	0.0378	0.1216	0.0742
6	-0.0648	0.0743	0.0560	0.0547	0.1208*	0.0656
7	-0.0057	0.0717	0.1030	0.0582	0.1087	0.0689
8	0.1037	0.0979	0.0308	0.0403	-0.0729	0.0639
9	0.0432	0.0554	0.0233	0.0275	-0.0198	0.0453
10	-0.0236	0.0366	0.0138	0.0469	0.0373	0.0407
1-10	-0.0286	0.0454	0.0077	0.0329	0.0362	0.0418

**Mid-month vs End-of-month Announcements in Post Period**

Decile	POST=1 & e=0		POST=1 & e=1		Diff	
	Mean	StdErr	Mean	StdErr	Mean	StdErr
1	0.0077	0.0370	-0.0503	0.0395	-0.0580	0.0449
2	-0.0389	0.0364	-0.0596	0.0363	-0.0206	0.0375
3	-0.0254	0.0491	-0.0445	0.0547	-0.0191	0.0197
4	0.0112	0.0709	-0.0575	0.0696	-0.0687	0.0598
5	0.0167	0.0365	-0.1127	0.0723	-0.1294*	0.0746
6	0.0425	0.0561	-0.0927	0.0800	-0.1352	0.0885
7	0.0918	0.0598	-0.0269	0.0720	-0.1187	0.0778
8	0.0254	0.0412	0.0870	0.0963	0.0616	0.0544
9	0.0109	0.0275	0.0282	0.0531	0.0173	0.0221
10	0.0060	0.0467	-0.0354	0.0376	-0.0414	0.0368
1-10	0.0002	0.0328	-0.0348	0.0469	-0.0350	0.0288

**Table IA.10. Trading Activity Prior to Short Interest Announcements**

This table presents trading activity prior to short interest announcements during our sample period. Panels A to C present overall trading activity in the stock market, Panels D to F focus on activity in the shorting market. We form 10 portfolios based on changes to short interest ( $\Delta SHORT$ ) on each announcement date.  $\Delta SHORT$  is the change in short interest between two successive short interest announcements, scaled by stock's shares outstanding. Decile 1 has a  $\Delta SHORT$  below the 10<sup>th</sup> percentile, and the Decile 10 has a  $\Delta SHORT$  above the 90<sup>th</sup> percentile. We report the equal-weighted averages in the 2 days before the short interest announcement, namely [-1,0]. We include the day of announcement because short interest is disclosed after 4:00 p.m. Panels A to F report *TURNOVER*, *VOLATILITY*, *SPREAD*, *SHORT INTEREST*, *NUMBER OF LOANS*, and *LOAN CONCENTRATION*. *TURNOVER* is daily stock volume divided by stock's shares outstanding; *VOLATILITY* is the difference between the stock's highest and lowest share prices in a given trading day, normalized by an average of the two; *SPREAD* is the daily stock bid-ask spread; *SHORT INT MARKET* is the daily total short positions reported by IHS Markit divided by stock's shares outstanding; *NUMBER OF LOANS* is the natural logarithm of total number of outstanding short loans in a given stock and day; *LOAN CONCENTRATION* is the Herfindahl-Hirschman Index calculated using outstanding short loans in a given stock and day. *SHORT INT MARKET*, *NUMBER OF LOANS* and *LOAN CONCENTRATION* are calculated using the daily IHS Markit data available from July 2006. Column 1 reports the results for the full sample and columns 2 and 3 for the subsamples of mid- and end-of-month announcements in the post period; column 4 show the difference between these two subsamples. Alphas are estimated using the time-series of portfolio returns and we report Newey-West standard errors with 5 lags (reported in parentheses). \*, \*\*, \*\*\* indicate 10%, 5% and 1% level of significance respectively.

**Panel A. TURNOVER**

Decile	Full	POST=1 & e=0	POST=1 & e=1	Diff
1	0.0114*** (0.0035)	0.0116*** (0.0006)	0.0128*** (0.0005)	0.0012* (0.0007)
2	0.0079*** (0.0009)	0.0082*** (0.0008)	0.0089*** (0.0006)	0.0007 (0.0005)
3	0.0057*** (0.0009)	0.0061*** (0.0006)	0.0068*** (0.0006)	0.0007 (0.0005)
4	0.0042*** (0.0008)	0.0046*** (0.0006)	0.0050*** (0.0004)	0.0004** (0.0002)
5	0.0037*** (0.0007)	0.0042*** (0.0004)	0.0043*** (0.0001)	0.0001 (0.0003)
6	0.0039*** (0.0005)	0.0043*** (0.0001)	0.0044*** (0.0004)	0.0001 (0.0004)
7	0.0046*** (0.0003)	0.0048*** (0.0001)	0.0049*** (0.0005)	0.0001 (0.0004)
8	0.0062*** (0.0004)	0.0069*** (0.0004)	0.0062*** (0.0002)	-0.0007* (0.0004)
9	0.0086*** (0.0006)	0.0094*** (0.0006)	0.0088*** (0.0005)	-0.0006 (0.0004)
10	0.0126*** (0.0009)	0.0134*** (0.0006)	0.0131*** (0.0009)	-0.0003 (0.0003)
1-10	-0.0012* (0.0007)	-0.0018 (0.0015)	-0.0003 (0.0003)	0.0014 (0.0013)

**Panel B. VOLATILITY**

Decile	Full	POST=1 & e=0	POST=1 & e=1	Diff
1	0.0354*** (0.002)	0.0369*** (0.0045)	0.0371*** (0.0046)	0.0002 (0.0002)
2	0.0335*** (0.0022)	0.0354*** (0.0047)	0.0350*** (0.0052)	-0.0006 (0.0004)
3	0.0338*** (0.0031)	0.0361*** (0.0051)	0.0362*** (0.0055)	0.0001 (0.0003)
4	0.0342*** (0.0034)	0.0366*** (0.0051)	0.0371*** (0.0052)	0.0005* (0.0003)
5	0.0342*** (0.0035)	0.0368*** (0.0046)	0.0369*** (0.0049)	0.0001 (0.0003)
6	0.0341*** (0.003)	0.0363*** (0.0041)	0.0365*** (0.0046)	0.0002 (0.0005)
7	0.0345*** (0.0031)	0.0367*** (0.0042)	0.0371*** (0.0053)	0.0004 (0.0011)
8	0.0341*** (0.0025)	0.0357*** (0.0048)	0.0363*** (0.0047)	0.0006** (0.0003)
9	0.0345*** (0.0019)	0.0358*** (0.0044)	0.0361*** (0.0046)	0.0003 (0.0002)
10	0.037*** (0.002)	0.0385*** (0.004)	0.0386*** (0.0041)	0.0001 (0.0001)
1-10	-0.0016* (0.0009)	-0.0016* (0.0009)	-0.0015* (0.0009)	0.0001 (0.0002)

**Panel C. SPREAD**

Decile	Full	POST =1 & e=0	POST =1 & e=1	Diff
1	0.0023*** (0.0006)	0.002*** (0.0003)	0.0018*** (0.0002)	-0.0002 (0.0002)
2	0.0031*** (0.0008)	0.0027*** (0.0002)	0.0023*** (0.0002)	-0.0004 (0.0003)
3	0.0057*** (0.0009)	0.0053*** (0.0003)	0.0048*** (0.0001)	-0.0005* (0.0003)
4	0.0097*** (0.0008)	0.0095*** (0.0003)	0.0088*** (0.0006)	-0.0007* (0.0004)
5	0.0118*** (0.001)	0.0108*** (0.0007)	0.0112*** (0.001)	0.0004 (0.0003)
6	0.0112*** (0.0004)	0.0112*** (0.0015)	0.0106*** (0.0008)	-0.0006 (0.0016)
7	0.0091*** (0.0009)	0.0099*** (0.0005)	0.0098*** (0.0007)	-0.0001 (0.0003)
8	0.0053***	0.0048***	0.0064***	0.0016

	(0.0004)	(0.0002)	(0.0013)	(0.0011)
9	0.0029***	0.0023***	0.0030***	0.0007
	(0.0003)	(0.0003)	(0.0007)	(0.0005)
10	0.0022***	0.0017***	0.0018***	0.0001
	(0.0005)	(0.0002)	(0.0002)	(0.0001)
Diff	0.0001	0.0002**	-0.0001	-0.0003
	(0.0001)	(0.0001)	(0.0001)	(0.0003)

**Panel D. SHORT INT MARKIT**

Decile	Full	POST =1 & e=0	POST =1 & e=1	Diff
1	7.2917***	7.1021***	7.2065***	0.1044
	(0.6367)	(0.5195)	(0.8022)	(0.6806)
2	4.3375***	4.3330***	4.2779***	-0.0551
	(0.4112)	(0.3791)	(0.4640)	(0.4825)
3	3.0136***	3.0235***	3.0440***	0.0205
	(0.2537)	(0.3020)	(0.3858)	(0.3698)
4	2.1549***	2.2386***	2.1278***	-0.1109
	(0.2249)	(0.2511)	(0.2436)	(0.2835)
5	1.7936***	1.8484***	1.7893***	-0.0590
	(0.1672)	(0.1577)	(0.2203)	(0.1939)
6	1.8681***	1.7979***	1.9054***	0.1074
	(0.1867)	(0.1636)	(0.3097)	(0.1885)
7	2.2468***	2.0721***	2.1451***	0.0729
	(0.2890)	(0.2458)	(0.2410)	(0.1907)
8	3.2248***	3.1210***	2.9351***	-0.1859
	(0.4023)	(0.2619)	(0.2805)	(0.2290)
9	4.8379***	4.6890***	4.4396***	-0.2494
	(0.5631)	(0.4636)	(0.3866)	(0.3538)
10	8.5078***	8.4091***	8.0943***	-0.3148
	(0.6969)	(0.6890)	(0.7016)	(0.5579)
1-10	-1.2161**	-1.3070*	-0.8878*	0.4192
	(0.5755)	(0.6807)	(0.5160)	(0.3639)

**Panel E. LOG NUMBER OF LOANS**

Decile	Full	POST =1 & e=0	POST =1 & e=1	Diff
1	5.4671***	5.4616***	5.4760***	0.0144
	(0.4581)	(0.7423)	(0.7319)	(0.1105)
2	5.0408***	5.0589***	5.0846***	0.0258
	(0.3987)	(0.6349)	(0.5648)	(0.0895)
3	4.5086***	4.5923***	4.5398***	-0.0525
	(0.6044)	(0.8698)	(0.6307)	(0.1071)
4	3.9004***	3.9449***	3.9906***	0.0457



	(0.8024)	(1.2713)	(1.0475)	(0.1662)
5	3.6289***	3.7461***	3.6643***	-0.0818
	(0.8866)	(1.0938)	(1.4521)	(0.1871)
6	3.7074***	3.8044***	3.7128***	-0.0916
	(0.7581)	(0.9441)	(0.7472)	(0.1149)
7	3.9668***	3.9028***	3.9777***	0.0749
	(0.7394)	(1.1255)	(0.9242)	(0.1468)
8	4.5656***	4.6068***	4.4338***	-0.1730
	(0.7226)	(0.7001)	(1.0340)	(0.1210)
9	5.1304***	5.0431***	5.1475***	0.1044
	(0.4786)	(0.5115)	(0.3980)	(0.0649)
10	5.5924***	5.5977***	5.5545***	-0.0432
	(0.4523)	(0.5724)	(0.6234)	(0.0899)
1-10	-0.1254	-0.1361	-0.0785	0.0576
	(0.2071)	(0.2989)	(0.2129)	(0.0373)

**Panel F. LOAN CONCENTRATION**

Decile	Full	POST =1 & e=0	POST =1 & e=1	Diff
1	0.2274***	0.2249***	0.2253***	0.0004
	(0.0322)	(0.0492)	(0.0458)	(0.0028)
2	0.2492***	0.2435***	0.2444***	0.0009
	(0.0469)	(0.0584)	(0.0480)	(0.0043)
3	0.2979***	0.2921***	0.2891***	-0.0030
	(0.0732)	(0.0989)	(0.0751)	(0.0094)
4	0.3554***	0.3477***	0.3447***	-0.0030
	(0.0959)	(0.1311)	(0.1220)	(0.0130)
5	0.3813***	0.3683***	0.3741***	0.0057
	(0.1108)	(0.1318)	(0.1750)	(0.0111)
6	0.3731***	0.3717***	0.3600***	-0.0117
	(0.0892)	(0.1056)	(0.0877)	(0.0117)
7	0.3450***	0.3470***	0.3425***	-0.0045
	(0.0675)	(0.1065)	(0.0782)	(0.0113)
8	0.2914***	0.2867***	0.3018***	0.0151
	(0.0641)	(0.0771)	(0.0948)	(0.0102)
9	0.2430***	0.2400***	0.2512***	0.0111
	(0.0389)	(0.0395)	(0.0401)	(0.0074)
10	0.2207***	0.2217***	0.2219***	0.0002
	(0.0259)	(0.0342)	(0.0280)	(0.0017)
1-10	0.0068	0.0033	0.0034	0.0002
	(0.0046)	(0.0029)	(0.0035)	(0.0036)