Internet Appendix for

U.S. Tick Size Pilot[1]

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[1] We thank Davide Cao, Minki Kim, and Andrea Lupi for excellent research assistance and the Baffi-Carefin Center for financial support.

IA.1 Firm fixed effects specification

Our main analysis uses difference-in-difference panel regressions without firm fixed effects as we wanted to verify that the coefficients for our group (G1, G2, and G3) and rule dummies (Q, T, and TA) were indeed insignificant after our sample screens. To validate the robustness of our results, we also re-estimate all our panel regressions using firm fixed effects, again clustering standard errors by firm and date. The results are virtually identical to those we present in the paper with this alternative specification.

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot Q \cdot Event + \gamma_4 \cdot T \cdot Event + \gamma_5 \cdot TA \cdot Event + \gamma_6 \cdot X_t + \mu_{i,t}, \quad (5)$$

where f_i are individual firm dummies, Event is a dummy that takes on a value of one starting October 31, 2016, Q is dummy that takes on a value of one for stocks subject to the quote rule (G1, G2, and G3), T is a dummy that takes on a value of one for stocks subject to the trade rule (G2 and G3), and TA is a dummy that takes on a value of one for stocks subject to the trade-at rule (G3).

[Insert Tables IA.1.3, IA.1.4, IA.1.7, IA.1.10, and IA.1.11]

IA.2 Results including the last week of September 2016

To avoid the anticipation effect and to keep the sample balanced at eight weeks pre- and eight weeks post-pilot, we exclude the week prior to the pilot, September 26-30, 2016, from our main analysis. However, our results are robust to including the week immediately preceding the start of the pilot.

[Insert Tables IA.2.3, IA.2.4, IA.2.7, IA.2.10, and IA.2.11]

IA.3 Results excluding the week of the 2016 Presidential Election

We conduct a number of tests to check that our results are robust to the choice of sample period and methodology.[2] The pilot was implemented in the midst of a contentious 2016 U.S. Presidential election, and as we noted above, the outcome of the election had repercussions that are clearly noticeable in Figures 1, 2, and 3. Hence, we re-examine our results excluding the week of the Presidential election, November 9-15, 2016, and find that our results are qualitatively unchanged.

[Insert Tables IA.3.3, IA.3.4, IA.3.7, IA.3.10, and IA.3.11]

[2] The robustness analyses are available from the authors on request.

IA.4 Results for tick-constrained (Q1) and unconstrained (Q4) stocks defined based on the quartiles of the pre-pilot quoted spread distribution

Another potential concern is that while the definition of tick-constrained stocks as those with a pre-event quoted spread of five cents or below may be uncontroversial, to define unconstrained stocks as those with a pre-event quoted spread of ten cents of above may seem ad hoc. We re-estimate all our analyses defining tick-constrained (unconstrained) stocks as those with pre-event quoted spreads in the lowest quartile (highest quartile), and find that our results are again robust.

[Insert Tables IA.4.6, IA.4.7, IA.4.9, and IA.4.11]

IA.5 Results for unconstrained stocks defined as those with pre-pilot quoted spread larger than 5 cents

To economize on space in the main analysis, we only report the results for tick-constrained stocks (pre-event quoted spread less than or equal to 5 cents) and unconstrained stocks (pre-event quoted spread greater than or equal to 10 cents). This section provides results for the omitted category, pre-event quoted spreads between 5 and 10 cents. Furthermore, for completeness, we repeat the analysis defining unconstrained stocks as those with a pre-event quoted spread above five cents (in the second, third, and fourth quartiles). The only notable difference is that with this definition we no longer find quoted and effective spreads to decline significantly for unconstrained stocks.

[Insert Tables IA.5.6, IA.5.7, IA.5.9, and IA.5.11]

IA.6 List of excluded symbols

As mentioned in Appendix B in the manuscript, we consider all common stocks involved in the pilot for NASDAQ and NYSE between August 1, 2016 and December 23, 2016 (our sample period) according to the U.S. tick size pilot list published on the FINRA website. We exclude securities consistently with the following rules:

I. Stocks that changed were moved from a test group to the control group during the pilot due to low stock price.

II. Stocks that changed symbols during the pilot.

III. Stocks that during the Pilot changed exchange listing.

IV. Preferred stocks.

V. Stocks (test stocks) initially used to test the Pilot.

VI. Stocks with too little trading volume for market quality to be reliably estimated: For each stock, we dropped the entire day if there were less than 20 trades on that day (including the opening trade). If for 1 stock we dropped more than 50% of the days of our sample period, we then dropped the stock from the sample.

VII. Stocks for which data are not available from TRTH or CRSP.

Stocks	Nasdaq	NYSE	Total	Percent
Eligible common stocks*	1,567	679	2,246	100.00%
Rule I	2	0	2	0.09%
Rule II	11	3	14	0.62%
Rule III	2	2	4	0.18%
Rule IV	0	11	11	0.49%
Rule V	4	4	8	0.36%
Rule VI	166	5	171	7.61%
Rule VII	0	2	2	0.09%
Final Sample	1,382	652	2,034	90.56%

*Eligible stocks in the pilot on December 23, 2016.

To facilitate replication, we list the excluded symbols in Table IA.6.

[Insert Table IA.6]

IA.7 Boundary Stocks Relative to Control Stocks

We define boundary stocks as stocks in CRSP with share code 10 or 11 that are listed on either NYSE or Nasdaq and were never part of the U.S. tick size pilot, and have either: (BP) a stock price between $1.50 and $2.00 and market capitalization less than or equal to $3bn on August 31, 2016, and an average daily share volume less than or equal to 1mn shares for the month of August, 2016; (BS) a stock price of at least $2.00 and market capitalization between $3bn and $6bn on August 31, 2016, and an average daily share volume less than or equal to 1mn shares for the month of August, 2016; or (BV) a stock price of at least $2.00 and market capitalization less than or equal to $3bn on August 31, 2016, and an average daily share volume between 1mn and 2mn shares for the month of August, 2016. There are 33 stocks in the BP sample, 25 stocks in the BS sample, and 32 stocks in the BV sample, for a total of 92 boundary stocks.

We run panel difference-in-difference regressions to evaluate changes in market quality, trading activity, and five minute realized spreads and price impacts for boundary stocks relative to either the entire

sample of control stocks (Table IA.7.1) or a subsample of control stocks that are close to each boundary (Table IA.7.2). To assign control stocks that are close to each boundary, we follow the same procedure as for the boundary stocks. Specifically, starting from the matched CRSP-pilot sample, we select: (CP) the 100 control stocks with prices closest to $2.00 on August 31, 2016, (CS) the 100 control stocks with market capitalization closest to $3bn on August 31, 2016, and the (CV) 100 control stocks with average daily volume for the month of August, 2016, closest to 1mn shares. We then take all stocks in each group that pass our other sample screens, ending up with 45 stocks in the CP, 50 stocks in the CS, and 42 stocks in the CV sample respectively for a total of 137 stocks.

[Insert Table IA.7.1, IA.7.2]

Table IA.7.1 shows that quoted spreads, effective spreads, volatility change significantly and with the opposite sign for all three boundary subsamples relative to controls. Depth and volume changes significantly in the opposite direction for the BP and BV samples, but is either insignificant or significantly positive for BS stocks (with market capitalization between $3bn and $6bn). With the exception of log average trade size in shares for the BV sample, average trade size increases significantly for boundary samples relative to control stocks. The results do not change qualitatively when we compare boundary stocks with control stocks close to the boundary in Table IA.7.2.

For completeness, we report the results for the other measures of quote condition and trading activity used elsewhere in the paper in Table IA.7.3. Panel A reports the results for boundary stocks relative to control stocks, Panel B reports the results for boundary stocks relative to control stocks close to the boundary, and Panel C reports the results for holdout stocks relative to control stocks. Percent quoted and effective spread are only significantly different for the holdout sample, and the interaction term is negative as in Table 7 in the paper. Recall that prices change significantly for boundary and holdout stocks relative to controls (and controls close to the boundary), which of course influences the percent spread results. The results for depth (without logs) are statistically weaker, and the interaction term is only significant for dollar depth with a positive sign in Panels A and B, and negative sign in Panel C. Caution is again warranted when interpreting the dollar depth results as prices change significantly. The interaction terms are positive and significant for volume in Panels A and B, and insignificant in Panel C. As in the main text, we conclude that the volume increase for control stocks appear to have been at least in part driven by fundamental factors. Finally, the interaction term tends to be positive for average trade size in Panels A and B, and insignificant in Panel C.

[Insert Table IA.7.3]

IA.8 Nasdaq-listed versus NYSE-listed Stocks

We repeat the main analysis using subsamples based on market of primary listing: Nasdaq or NYSE. The descriptive statistics for these subsamples are in Table IA.8.1. There are 1,380 Nasdaq-listed and 649 NYSE-listed stocks in our sample. While NYSE-listed pilot firms on average have significantly larger market capitalization (slightly over $1 billion compared to roughly $600 million), and their stocks have narrower spreads (6-7 cents compared to 9-10 cents), lower volatility roughly 2% compared to 3%), and larger consolidated volume (close to 300,000 shares compared to less than 200,000 shares) than Nasdaq-listed pilot stocks, the average stock price in each subsample is similar ($23.52 compared to $23.61). Hence, in addition to subsampling on exchange listing, this cut provides an alternative way of comparing stocks along the liquidity dimension while keeping the tick size relative to the stock price constant.

[Insert Table IA.8.1]

We report the results for changes in market quality based on difference-in-difference panel regressions for each subsample in Tables IA.8.2 and the results for changes in market quality based on difference-in-difference collapsed panel regressions in Table IA.8.3. The effects of the quote rule and the trade-at rules are qualitatively the same as the ones we find for the overall sample regardless of market of primary listing. Specifically, the quote rule causes quoted spreads to widen, depth to increase, average trade size to increase, but volume is unchanged.

[Insert Table IA.8.2]

[Insert Table IA.8.3]

The results in Table D3 also show that there are notable differences between the subsamples. First, quoted spreads widen more for NYSE-listed stocks (2.22 cents) than for Nasdaq-listed stocks (1.36 cents). Second, there is no spillover effect of the pilot on quoted spreads and a small effect on logdepth (0.028) for NYSE-listed control stocks while Nasdaq-listed control stocks experience a significant widening of quoted spreads (1.99 cents) and a larger effect on logdepth (0.075). Third, the trade rule is associated with a significant decline in logdepth (-0.046) for Nasdaq-listed stocks and a significant increase in logdepth (0.086) for NYSE-listed stocks. Similarly, the trade rule is associated with a decline (albeit not significant) in the logarithm of average trade size for Nasdaq-listed stocks, but a significant increase in the logarithm of average trade size for NYSE-listed stocks. Hence, the trade rule appears more effective in attracting limit orders away from the dark to the lit market for larger capitalization (more liquid) stocks than for stocks of lower capitalization (less liquid) stocks.

We graph the daily averages for each group of stocks (C, G1, G2, and G3) of quoted spreads, effective spreads, depth, and consolidated volume for Nasdaq-listed stocks in Figure D1 and for NYSE listed stocks in Figure D2. The figures show that quoted spreads, effective spreads, and depth changes significantly while volume does not show a clear pattern of a change between the pre- and the post-pilot periods both for Nasdaq and NYSE stocks. Furthermore, they suggest that caution is warranted in interpreting the differences between Nasdaq and NYSE stocks when it comes to depth and average trade size. While the effect on depth for Nasdaq-listed stocks in G2 (those subject to the quote and trade rules) actually increases over time, the effect on depth for G2 stocks disappears by late December. This motivates future longer-term studies of the effect of the tick size pilot on market quality.

[Insert Figure IA.8.1 here]

[Insert Figure IA.8.2 here]

Table IA.1.3. Changes in Market Quality: Firm Fixed Effects Panel Regressions (Groups)

A. Quote Condition	Quoted Spread		Effective Spread		Depth		log Depth		Volatility	
	(dollar)	(%)	(dollar)	(%)	(shares)	(dollar)	(shares)	(dollar)	quote upd.	5min
Intercept	0.0857 ***	0.0044 ***	0.0348 ***	0.0019 ***	11.91 ***	173.12 ***	1.892 ***	4.801 ***	0.0239 ***	0.0181 ***
	0.0009	0.0001	0.0007	0.0001	0.84	12.62	0.007	0.006	0.0003	0.0003
Event	0.0177 ***	0.0006 ***	0.0052 ***	0.0002 ***	1.63 ***	21.26 ***	0.056 ***	0.084 ***	0.0051 ***	0.0049 ***
	0.0004	0.0000	0.0003	0.0000	0.22	2.37	0.003	0.003	0.0002	0.0001
G1*Event	0.0145 ***	0.0022 ***	0.0175 ***	0.0018 ***	21.76 ***	182.61 ***	0.762 ***	0.776 ***	0.0029 ***	0.0007 ***
	0.0009	0.0001	0.0005	0.0001	0.79	6.12	0.007	0.006	0.0003	0.0003
G2*Event	0.0148 ***	0.0019 ***	0.0193 ***	0.0018 ***	23.20 ***	306.03 ***	0.755 ***	0.776 ***	0.0023 ***	0.0002
	0.0009	0.0001	0.0006	0.0000	1.25	21.14	0.007	0.007	0.0003	0.0002
G3*Event	0.0150 ***	0.0022 ***	0.0164 ***	0.0018 ***	21.35 ***	211.04 ***	0.809 ***	0.824 ***	0.0086 ***	0.0019 ***
	0.0008	0.0001	0.0010	0.0001	0.59	5.73	0.007	0.007	0.0003	0.0002
VIX	-0.0001 *	0.0001 ***	0.0004 ***	0.0001 ***	-0.27 ***	-3.92 ***	-0.007 ***	-0.018 ***	0.0004 ***	0.0004 ***
	0.0001	0.0000	0.0001	0.0000	0.06	0.94	0.000	0.000	0.0000	0.0000
FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nobs	152,358	152,358	152,358	152,358	152,358	152,358	152,358	152,358	152,358	152,358
R2 within	0.0459	0.0561	0.0302	0.0440	0.0238	0.0148	0.2985	0.3336	0.0376	0.0338
F-value	1,459.8	1,704.2	1,082.6	1,149.6	614.0	681.4	10,953.9	13,183.6	1,132.3	1,041.8

B. Trading Activity	Volume		log Volume		Average Trade Size		Log Average Trade Size		Price
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)
Intercept	201,577 ***	5,335,640 ***	11.575 ***	14.483 ***	136.72 ***	2,758.28 ***	4.781 ***	7.688 ***	27.01 ***
	7,038	133,778	0.009	0.009	1.68	14.83	0.004	0.004	0.04
Event	69,902 ***	1,506,198 ***	0.292 ***	0.321 ***	2.91 **	66.18 ***	0.013 ***	0.041 ***	1.58 ***
	3,557	68,848	0.005	0.005	1.36	8.69	0.002	0.002	0.02
G1*Event	-5,280	233,690 *	-0.051 ***	-0.034 ***	12.31 ***	252.02 ***	0.073 ***	0.089 ***	0.40 ***
	6,784	126,657	0.009	0.009	1.61	14.42	0.004	0.004	0.05
G2*Event	-31,900 ***	-322,574 **	-0.069 ***	-0.046 ***	10.14 ***	249.79 ***	0.070 ***	0.092 ***	0.32 ***
	5,894	125,535	0.009	0.009	1.83	15.98	0.004	0.004	0.04
G3*Event	-25,339 ***	-532,779 ***	-0.088 ***	-0.071 ***	5.09 **	157.27 ***	0.029 ***	0.045 ***	0.26 ***
	6,086	120,918	0.009	0.009	2.03	17.44	0.004	0.004	0.04
VIX	1,794 ***	-266	-0.004 ***	-0.016 ***	-0.27 **	-27.82 ***	-0.001 ***	-0.012 ***	-0.30 ***
	523	9,877	0.001	0.001	0.11	1.07	0.000	0.000	0.00
FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nobs	152,358	152,358	152,358	152,358	152,358	152,358	152,358	152,358	152,358
R2 within	0.0050	0.0065	0.0402	0.0493	0.0009	0.0103	0.0086	0.0282	0.1012
F-value	143.6	196.7	1,277.7	1,586.3	92.7	408.6	265.4	901.8	3,136.3

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for the U.S. tick size pilot sample stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot G1 \cdot Event + \gamma_4 \cdot G2 \cdot Event + \gamma_5 \cdot G3 \cdot Event + \gamma_6 \cdot X_t + \mu_{i,t}, \quad (5)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock i on day t, f_i are individual firm dummies, *Event* is a dummy that takes on a value of one for days in the post-period, *G1*, *G2*, and *G3* are pilot test group dummies, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, G1 stocks will be subject to the quote rule, G2 stocks to the quote and the trade rules, and G3 stocks to the quote, trade, and trade-at rules. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.1.4. Changes in Market Quality: Fixed Effects Firm Fixed Effects Panel Regressions (Rules)

	Quoted Spread		Effective Spread		log Depth				Volatility	
A. Quote Condition	Tick Constrained	Unconstrained	Tick Constrained	Unconstrained	Tick Constrained		Unconstrained		Tick Constrained	Unconstrained
	(dollar)	(dollar)	(dollar)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	Midquote	Midquote
Intercept	0.0282 ***	0.2090 ***	0.0140 ***	0.0770 ***	2.164 ***	4.735 ***	1.591 ***	5.051 ***	0.0213 ***	0.0284 ***
	0.0002	0.0032	0.0005	0.0022	0.009	0.009	0.012	0.012	0.0004	0.0008
Event	0.0051 ***	0.0503 ***	0.0026 ***	0.0124 ***	0.011 ***	0.028 ***	0.099 ***	0.169 ***	0.0044 ***	0.0069 ***
	0.0001	0.0017	0.0002	0.0010	0.004	0.004	0.006	0.006	0.0002	0.0004
Q*Event	0.0319 ***	-0.0261 ***	0.0231 ***	0.0058 ***	1.081 ***	1.106 ***	0.306 ***	0.282 ***	0.0082 ***	-0.0032 ***
	0.0002	0.0031	0.0004	0.0018	0.009	0.009	0.013	0.012	0.0004	0.0009
T*Event	0.0005 **	-0.0012	0.0015 ***	0.0018	0.015	0.017	-0.038 **	-0.022	0.0003	-0.0021 **
	0.0002	0.0037	0.0005	0.0023	0.012	0.012	0.015	0.015	0.0005	0.0010
TA*Event	-0.0020 ***	0.0044	-0.0036 ***	-0.0023	0.106 ***	0.085 ***	0.007	0.010	0.0083 ***	0.0034 ***
	0.0002	0.0037	0.0005	0.0037	0.012	0.012	0.015	0.015	0.0005	0.0008
VIX	0.0000	-0.0004 *	0.0003 ***	0.0005 ***	-0.006 ***	-0.018 ***	-0.008 ***	-0.019 ***	0.0004 ***	0.0003 ***
	0.0000	0.0002	0.0000	0.0002	0.001	0.001	0.001	0.001	0.0000	0.0001
FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nobs	74,984	39,762	74,984	39,762	74,984	74,984	39,762	39,762	74,984	39,762
R2 within	0.6410	0.0292	0.1649	0.0095	0.4533	0.4851	0.0949	0.1347	0.1138	0.0115
F-value	31,216.8	230.1	3,383.3	105.2	10,678.9	12,416.7	798.1	1,206.9	1,514.6	101.8

	log Volume				log Average Trade Size				Price	
B. Trading Activity	Tick Constrained		Unconstrained		Tick Constrained		Unconstrained		Tick Constrained	Unconstrained
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)	(dollar)
Intercept	12.218 ***	14.789 ***	10.611 ***	14.066 ***	4.901 ***	7.472 ***	4.587 ***	8.042 ***	17.24 ***	43.87 ***
	0.013	0.013	0.019	0.019	0.005	0.006	0.009	0.009	0.04	0.13
Event	0.255 ***	0.272 ***	0.331 ***	0.400 ***	-0.002	0.016 ***	0.020 ***	0.090 ***	0.86 ***	3.32 ***
	0.006	0.006	0.009	0.010	0.003	0.003	0.005	0.005	0.02	0.07
Q*Event	-0.055 ***	-0.028 **	-0.041 **	-0.065 ***	0.101 ***	0.128 ***	0.031 ***	0.007	0.20 ***	0.19
	0.013	0.013	0.018	0.018	0.005	0.006	0.009	0.009	0.04	0.16
T*Event	-0.038 **	-0.037 **	0.027	0.045 **	0.001	0.002	0.007	0.025 **	0.30 ***	-0.62 ***
	0.016	0.016	0.022	0.022	0.007	0.007	0.010	0.011	0.05	0.17
TA*Event	0.055 ***	0.033 **	-0.107 ***	-0.105 ***	-0.040 ***	-0.062 ***	-0.039 ***	-0.037 ***	-0.48 ***	0.65 ***
	0.015	0.016	0.022	0.023	0.006	0.007	0.011	0.011	0.05	0.14
VIX	-0.001	-0.013 ***	-0.010 ***	-0.020 ***	-0.001	-0.012 ***	-0.003 ***	-0.013 ***	-0.20 ***	-0.47 ***
	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.00	0.01
FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nobs	74,984	74,984	39,762	39,762	74,984	74,984	39,762	39,762	74,984	39,762
R2 within	0.0341	0.0389	0.0502	0.0700	0.0147	0.0339	0.0035	0.0268	0.1040	0.1363
F-value	529.1	610.3	428.1	607.6	222.6	542.01	28.8	223.2	1,634.6	1,167.3

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for the U.S. tick size pilot sample stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot Q \cdot Event + \gamma_4 \cdot T \cdot Event + \gamma_5 \cdot TA \cdot Event + \gamma_6 \cdot X_t + \mu_{i,t}, \qquad (5)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock i on day t, f_i are individual firm dummies, *Event* is a dummy that takes on a value of one for days in the post-period, Q, T, and TA are dummies for stocks subject to the quote rule, trade rule, and trade-at rules respectively, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.1.7. Changes in Market Quality for Tick-Constrained and Unconstrained Stocks: Firm Fixed Effects Panel Regressions (Rules)

	Quoted Spread		Effective Spread		log Depth				Volatility	
A. Quote Condition	Tick Constrained (dollar)	Unconstrained (dollar)	Tick Constrained (dollar)	Unconstrained (dollar)	Tick Constrained (shares)	Tick Constrained (dollar)	Unconstrained (shares)	Unconstrained (dollar)	Tick Constrained Midquote	Unconstrained Midquote
Intercept	0.0282 ***	0.2090 ***	0.0140 ***	0.0770 ***	2.164 ***	4.735 ***	1.591 ***	5.051 ***	0.0213 ***	0.0284 ***
	0.0002	0.0032	0.0005	0.0022	0.009	0.009	0.012	0.012	0.0004	0.0008
Event	0.0051 ***	0.0503 ***	0.0026 ***	0.0124 ***	0.011 ***	0.028 ***	0.099 ***	0.169 ***	0.0044 ***	0.0069 ***
	0.0001	0.0017	0.0002	0.0010	0.004	0.004	0.006	0.006	0.0002	0.0004
Q*Event	0.0319 ***	-0.0261 ***	0.0231 ***	0.0058 ***	1.081 ***	1.106 ***	0.306 ***	0.282 ***	0.0082 ***	-0.0032 ***
	0.0002	0.0031	0.0004	0.0018	0.009	0.009	0.013	0.012	0.0004	0.0009
T*Event	0.0005 **	-0.0012	0.0015 ***	0.0018	0.015	0.017	-0.038 **	-0.022	0.0003	-0.0021 **
	0.0002	0.0037	0.0005	0.0023	0.012	0.012	0.015	0.015	0.0005	0.0010
TA*Event	-0.0020 ***	0.0044	-0.0036 ***	-0.0023	0.106 ***	0.085 ***	0.007	0.010	0.0083 ***	0.0034 ***
	0.0002	0.0037	0.0005	0.0037	0.012	0.012	0.015	0.015	0.0005	0.0008
VIX	0.0000	-0.0004 *	0.0003 ***	0.0005 ***	-0.006 ***	-0.018 ***	-0.008 ***	-0.019 ***	0.0004 ***	0.0003 ***
	0.0000	0.0002	0.0000	0.0002	0.001	0.001	0.001	0.001	0.0000	0.0001
FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nobs	74,984	39,762	74,984	39,762	74,984	74,984	39,762	39,762	74,984	39,762
R2 within	0.6410	0.0292	0.1649	0.0095	0.4533	0.4851	0.0949	0.1347	0.1138	0.0115
F-value	31,216.8	230.1	3,383.3	105.2	10,678.9	12,416.7	798.1	1,206.9	1,514.6	101.8

	log Volume				log Average Trade Size				Price	
B. Trading Activity	Tick Constrained (shares)	Tick Constrained (dollar)	Unconstrained (shares)	Unconstrained (dollar)	Tick Constrained (shares)	Tick Constrained (dollar)	Unconstrained (shares)	Unconstrained (dollar)	Tick Constrained (dollar)	Unconstrained (dollar)
Intercept	12.218 ***	14.789 ***	10.611 ***	14.066 ***	4.901 ***	7.472 ***	4.587 ***	8.042 ***	17.24 ***	43.87 ***
	0.013	0.013	0.019	0.019	0.005	0.006	0.009	0.009	0.04	0.13
Event	0.255 ***	0.272 ***	0.331 ***	0.400 ***	-0.002	0.016 ***	0.020 ***	0.090 ***	0.86 ***	3.32 ***
	0.006	0.006	0.009	0.010	0.003	0.003	0.005	0.005	0.02	0.07
Q*Event	-0.055 ***	-0.028 **	-0.041 **	-0.065 ***	0.101 ***	0.128 ***	0.031 ***	0.007	0.20 ***	0.19
	0.013	0.013	0.018	0.018	0.005	0.006	0.009	0.009	0.04	0.16
T*Event	-0.038 **	-0.037 **	0.027	0.045 **	0.001	0.002	0.007	0.025 **	0.30 ***	-0.62 ***
	0.016	0.016	0.022	0.022	0.007	0.007	0.010	0.011	0.05	0.17
TA*Event	0.055 ***	0.033 **	-0.107 ***	-0.105 ***	-0.040 ***	-0.062 ***	-0.039 ***	-0.037 ***	-0.48 ***	0.65 ***
	0.015	0.016	0.022	0.023	0.006	0.007	0.011	0.011	0.05	0.14
VIX	-0.001	-0.013 ***	-0.010 ***	-0.020 ***	-0.001	-0.012 ***	-0.003 ***	-0.013 ***	-0.20 ***	-0.47 ***
	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.00	0.01
FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nobs	74,984	74,984	39,762	39,762	74,984	74,984	39,762	39,762	74,984	39,762
R2 within	0.0341	0.0389	0.0502	0.0700	0.0147	0.0339	0.0035	0.0268	0.1040	0.1363
F-value	529.1	610.3	428.1	607.6	222.6	542.01	28.8	223.2	1,634.6	1,167.3

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for tick-constrained and unconstrained U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. Tick-constrained stocks are those with an average quoted spread of $0.05 or less and unconstrained stocks are those with an average quoted spread of $0.10 or more in the pre-pilot period. We use the following specification:

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot Q \cdot Event + \gamma_4 \cdot T \cdot Event + \gamma_5 \cdot TA \cdot Event + \gamma_6 \cdot X_t + \mu_{i,t}, \qquad (5)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock i on day t, f_i are individual firm dummies, *Event* is a dummy that takes on a value of one for days in the post-period, Q, T, and TA are dummies for stocks subject to the quote rule, trade rule, and trade-at rules respectively, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.1.10. Changes in the Term Structure of Liquidity Provision and Price Impacts: Firm Fixed Effects Panel Regressions (Rules)

A. Realized Spread	30 second horizon	1 minute horizon	2 minute horizon	3 minute horizon	4 minute horizon	5 minute horizon
Intercept	0.0125 ***	0.0111 ***	0.0100 ***	0.0095 ***	0.0091 ***	0.0090 ***
	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Event	0.0012 ***	0.0012 ***	0.0008 ***	0.0007 ***	0.0006 **	0.0007 ***
	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
Q*Event	0.0077 ***	0.0075 ***	0.0075 ***	0.0073 ***	0.0072 ***	0.0070 ***
	0.0005	0.0005	0.0005	0.0005	0.0005	0.0006
T*Event	0.0013 **	0.0013 *	0.0010	0.0010	0.0009	0.0011
	0.0007	0.0007	0.0007	0.0007	0.0007	0.0008
TA*Event	-0.0034 ***	-0.0031 ***	-0.0032 ***	-0.0031 ***	-0.0029 ***	-0.0029 ***
	0.0007	0.0007	0.0007	0.0008	0.0008	0.0008
VIX	0.0004 ***	0.0004 ***	0.0004 ***	0.0004 ***	0.0005 ***	0.0005 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FE	Y	Y	Y	Y	Y	Y
Nobs	152,357	152,357	152,357	152,357	152,357	152,357
R2 within	0.0093	0.0084	0.0070	0.0063	0.0058	0.0055
F-value	251.0	227.1	187.8	171.8	158.4	149.8

B. Price Impact	30 second horizon	1 minute horizon	2 minute horizon	3 minute horizon	4 minute horizon	5 minute horizon
Intercept	0.0094 ***	0.0101 ***	0.0107 ***	0.0110 ***	0.0112 ***	0.0112 ***
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Event	0.0018 ***	0.0018 ***	0.0020 ***	0.0020 ***	0.0021 ***	0.0020 ***
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Q*Event	0.0046 ***	0.0047 ***	0.0047 ***	0.0048 ***	0.0048 ***	0.0049 ***
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
T*Event	0.0006 ***	0.0006 ***	0.0007 ***	0.0008 ***	0.0008 ***	0.0007 **
	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
TA*Event	0.0002	0.0000	0.0001	0.0000	-0.0001	-0.0001
	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
VIX	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FE	Y	Y	Y	Y	Y	Y
Nobs	152,357	152,357	152,357	152,357	152,357	152,357
R2 within	0.0465	0.0394	0.0346	0.0314	0.0288	0.0265
F-value	1,340.5	1,143.0	981.3	896.6	825.5	760.7

This table reports the results from difference-in-difference panel regressions that test for changes in the term structure of liquidity provision and price discovery for U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. We use the following specification:

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot Q \cdot Event + \gamma_4 \cdot T \cdot Event + \gamma_5 \cdot TA \cdot Event + \gamma_6 \cdot X_t + \mu_{i,t}, \qquad (5)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock i on day t, f_i are individual firm dummies, *Event* is a dummy that takes on a value of one for days in the post-period, Q, T, and TA are dummies for stocks subject to the quote rule, trade rule, and trade-at rules respectively, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.1.11. Changes in the Term Structure of Liquidity Provision and Price Impacts for Tick-Constrained and Unconstrained Stocks: Firm Fixed Effects Panel Regressions (Rules)

A. Realized Spread	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained
Intercept	0.0015 ***	0.0365 ***	0.0010 *	0.0331 ***	0.0011 **	0.0294 ***	0.0011 **	0.0272 ***	0.0013 ***	0.0259 ***	0.0014 ***	0.0252 ***
	0.0005	0.0018	0.0005	0.0019	0.0005	0.0019	0.0005	0.0019	0.0005	0.0020	0.0005	0.0020
Event	0.0011 ***	0.0020 **	0.0011 ***	0.0018 **	0.0010 ***	0.0009	0.0010 ***	0.0007	0.0011 ***	0.0002	0.0011 ***	0.0005
	0.0002	0.0008	0.0002	0.0008	0.0002	0.0009	0.0002	0.0009	0.0002	0.0009	0.0002	0.0010
Q*Event	0.0111 ***	0.0005	0.0107 ***	0.0005	0.0103 ***	0.0014	0.0098 ***	0.0019	0.0095 ***	0.0025	0.0093 ***	0.0019
	0.0004	0.0015	0.0004	0.0016	0.0004	0.0016	0.0004	0.0017	0.0004	0.0017	0.0004	0.0017
T*Event	0.0006	0.0023	0.0004	0.0024	0.0002	0.0019	0.0003	0.0015	0.0004	0.0007	0.0005	0.0011
	0.0004	0.0021	0.0005	0.0021	0.0005	0.0022	0.0005	0.0022	0.0005	0.0023	0.0005	0.0023
TA*Event	-0.0030 ***	-0.0044 **	-0.0027 ***	-0.0044 *	-0.0023 ***	-0.0052 **	-0.0021 ***	-0.0056 **	-0.0021 ***	-0.0048 **	-0.0021 ***	-0.0050 **
	0.0004	0.0022	0.0005	0.0023	0.0005	0.0023	0.0005	0.0023	0.0005	0.0024	0.0005	0.0024
VIX	0.0003 ***	0.0006 ***	0.0003 ***	0.0007 ***	0.0003 ***	0.0008 ***	0.0003 ***	0.0009 ***	0.0003 ***	0.0009 ***	0.0003 ***	0.0009 ***
	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nobs	74,984	39,761	74,984	39,761	74,984	39,761	74,984	39,761	74,984	39,761	74,984	39,761
R2 within	0.0575	0.0013	0.0490	0.0013	0.0408	0.0013	0.0357	0.0014	0.0328	0.0014	0.0302	0.0014
F-value	943.9	9.2	775.9	9.2	638.4	9.1	548.2	10.2	501.2	10.4	451.1	10.6

B. Price Impact	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained
Intercept	0.0052 ***	0.0175 ***	0.0055 ***	0.0192 ***	0.0055 ***	0.0211 ***	0.0054 ***	0.0222 ***	0.0053 ***	0.0229 ***	0.0053 ***	0.0233 ***
	0.0001	0.0005	0.0001	0.0006	0.0001	0.0007	0.0001	0.0007	0.0001	0.0007	0.0002	0.0008
Event	0.0006 ***	0.0047 ***	0.0006 ***	0.0048 ***	0.0006 ***	0.0052 ***	0.0006 ***	0.0054 ***	0.0006 ***	0.0056 ***	0.0006 ***	0.0055 ***
	0.0000	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0004	0.0001	0.0004	0.0001	0.0004
Q*Event	0.0058 ***	0.0021 ***	0.0060 ***	0.0021 **	0.0062 ***	0.0016 **	0.0064 ***	0.0013 **	0.0066 ***	0.0011	0.0067 ***	0.0013 *
	0.0001	0.0005	0.0001	0.0006	0.0001	0.0006	0.0001	0.0007	0.0001	0.0007	0.0002	0.0007
T*Event	0.0006 ***	0.0007	0.0007 ***	0.0007	0.0008 ***	0.0009	0.0007 ***	0.0012	0.0007 ***	0.0015 *	0.0006 ***	0.0014
	0.0001	0.0007	0.0001	0.0007	0.0002	0.0008	0.0002	0.0009	0.0002	0.0009	0.0002	0.0010
TA*Event	-0.0004 ***	0.0016 **	-0.0006 ***	0.0016 **	-0.0008 ***	0.0020 **	-0.0009 ***	0.0022 **	-0.0009 ***	0.0018 *	-0.0009 ***	0.0018 *
	0.0001	0.0007	0.0001	0.0008	0.0002	0.0009	0.0002	0.0009	0.0002	0.0010	0.0002	0.0010
VIX	0.0000 ***	-0.0002 ***	0.0000 ***	-0.0002 ***	0.0000 *	-0.0002 ***	0.0000	-0.0003 ***	0.0000	-0.0003 ***	0.0000	-0.0003 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nobs	74,984	39,761	74,984	39,761	74,984	39,761	74,984	39,761	74,984	39,761	74,984	39,761
R2 within	0.2041	0.0270	0.1811	0.0224	0.1620	0.0202	0.1457	0.0185	0.1314	0.0173	0.1170	0.0159
F-value	3,153.9	210.2	2,860.0	174.6	2,440.4	155.6	2,189.1	141.2	1,990.2	131.8	1,743.3	120.0

This table reports the results from difference-in-difference panel regressions that test for changes in the term structure of liquidity provision and price impacts for U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. Tick-constrained stocks are those with an average quoted spread of $0.05 or less and unconstrained stocks are those with an average quoted spread of $0.10 or more in the pre-pilot period. We use the following specification:

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot Q \cdot Event + \gamma_4 \cdot T \cdot Event + \gamma_5 \cdot TA \cdot Event + \gamma_6 \cdot X_t + \mu_{i,t}, \qquad (5)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock i on day t, f_i are individual firm dummies, *Event* is a dummy that takes on a value of one for days in the post-period, Q, T, and TA are dummies for stocks subject to the quote rule, trade rule, and trade-at rules respectively, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.2.3. Changes in Market Quality: Panel Regressions (Groups) that includes the last week of September

A. Quote Quality	Quoted Spread		Effective Spread		Depth		log Depth		Volatility	
	(dollar)	(%)	(dollar)	(%)	(shares)	(dollar)	(shares)	(dollar)	quote upd.	5min
Intercept	0.0918 ***	0.0046 ***	0.0363 ***	0.0020 ***	11.83 ***	172.69 ***	1.884 ***	4.785 ***	0.0243 ***	0.0182 ***
	0.0043	0.0002	0.0014	0.0001	1.05	14.63	0.020	0.018	0.0005	0.0004
Event	0.0172 ***	0.0006 ***	0.0052 ***	0.0002 ***	1.69 ***	21.91 ***	0.061 ***	0.088 ***	0.0051 ***	0.0050 ***
	0.0004	0.0000	0.0003	0.0000	0.22	2.36	0.003	0.003	0.0001	0.0001
G1*Event	0.0143 ***	0.0022 ***	0.0174 ***	0.0018 ***	21.70 ***	182.39 ***	0.759 ***	0.774 ***	0.0028 ***	0.0006 **
	0.0009	0.0001	0.0005	0.0001	0.79	6.14	0.007	0.006	0.0003	0.0003
G2*Event	0.0149 ***	0.0019 ***	0.0192 ***	0.0018 ***	23.11 ***	305.19 ***	0.752 ***	0.772 ***	0.0023 ***	0.0002
	0.0009	0.0001	0.0006	0.0000	1.26	21.25	0.007	0.006	0.0003	0.0002
G3*Event	0.0155 ***	0.0023 ***	0.0169 ***	0.0018 ***	21.34 ***	210.61 ***	0.809 ***	0.823 ***	0.0086 ***	0.0018 ***
	0.0008	0.0001	0.0009	0.0001	0.59	5.73	0.007	0.007	0.0003	0.0002
VIX	-0.0001	0.0001 ***	0.0004 ***	0.0001 ***	-0.27 ***	-3.91 ***	-0.007 ***	-0.018 ***	0.0004 ***	0.0004 ***
	0.0001	0.0000	0.0001	0.0000	0.06	0.98	0.000	0.000	0.0000	0.0000
Nobs	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257
R2 within	0.046	0.057	0.031	0.045	0.025	0.015	0.302	0.336	0.038	0.035
Wald Chi2(8)	7,413.7	8,896.4	6,078.1	6,202.8	5,317.9	5,348.2	57,954.4	69,313.0	5,962.3	5,622.6

B. Trading Activity	Volume		log Volume		Average Trade Size		Log Average Trade Size		Price
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)
Intercept	194,189 ***	5,245,935 ***	11.522 ***	14.422 ***	138.47 ***	2,750.11 ***	4.776 ***	7.676 ***	27.21 ***
	11,380	309,794	0.042	0.054	3.51	62.77	0.013	0.022	0.82
Event	68,670 ***	1,488,600 ***	0.293 ***	0.319 ***	3.40 ***	70.24 ***	0.017 ***	0.044 ***	1.54 ***
	3,595	68,233	0.004	0.005	1.25	8.32	0.002	0.002	0.02
G1*Event	-6,136	230,342 *	-0.055 ***	-0.038 ***	11.52 ***	244.97 ***	0.070 ***	0.087 ***	0.41 ***
	6,791	125,629	0.009	0.009	1.54	14.44	0.004	0.004	0.05
G2*Event	-29,683 ***	-298,195 **	-0.073 ***	-0.051 ***	9.82 ***	248.80 ***	0.068 ***	0.090 ***	0.33 ***
	5,805	122,482	0.009	0.009	1.73	15.59	0.004	0.004	0.04
G3*Event	-25,560 ***	-579,035 ***	-0.093 ***	-0.077 ***	4.73 **	153.66 ***	0.027 ***	0.043 ***	0.26 ***
	6,125	124,733	0.009	0.009	1.94	17.08	0.004	0.004	0.04
VIX	1,770 ***	-1,429	-0.005 ***	-0.016 ***	-0.31 ***	-28.04 ***	-0.001 ***	-0.012 ***	-0.30 ***
	527	9,961	0.001	0.001	0.11	1.07	0.000	0.000	0.00
Nobs	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257
R2 within	0.005	0.006	0.039	0.048	0.001	0.010	0.009	0.028	0.098
Wald Chi2(8)	737.5	1,030.2	6,609.5	8,118.9	439.7	2,168.0	1,491.8	4,679.5	15,082.7

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for the U.S. tick size pilot sample stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot G1 + \beta_2 \cdot G2 + \beta_3 \cdot G3 + \beta_4 \cdot Event + \beta_5 \cdot G1 \cdot Event + \beta_6 \cdot G2 \cdot Event + \beta_7 \cdot G3 \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (1)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock *i* on day *t*, *G1*, *G2* and *G3* are dummies that take on a value of one for stocks belonging to the respective test groups, *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 30, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, G1 stocks will be subject to the quote rule, G2 stocks to the quote and the trade rules, and G3 stocks to the quote, trade, and trade-at rules. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.2.4. Changes in Market Quality: Panel Regressions (Rules) that includes the last week of September

A. Quote Quality	Quoted Spread		Effective Spread		Depth		log Depth		Volatility	
	(dollar)	(%)	(dollar)	(%)	(shares)	(dollar)	(shares)	(dollar)	Midquote	5min
Intercept	0.0918 ***	0.0046 ***	0.0363 ***	0.0020 ***	11.83 ***	172.69 ***	1.884 ***	4.785 ***	0.0243 ***	0.0182 ***
	0.0043	0.0002	0.0014	0.0001	1.05	14.63	0.020	0.018	0.0005	0.0004
Event	0.0172 ***	0.0006 ***	0.0052 ***	0.0002 ***	1.69 ***	21.91 ***	0.061 ***	0.088 ***	0.0051 ***	0.0050 ***
	0.0004	0.0000	0.0003	0.0000	0.22	2.36	0.003	0.003	0.0001	0.0001
Q*Event	0.0143 ***	0.0022 ***	0.0174 ***	0.0018 ***	21.70 ***	182.39 ***	0.759 ***	0.774 ***	0.0028 ***	0.0006 **
	0.0009	0.0001	0.0005	0.0001	0.79	6.14	0.007	0.006	0.0003	0.0003
T*Event	0.0006	-0.0004 ***	0.0018 **	0.0000	1.41	122.81 ***	-0.007	-0.002	-0.0005	-0.0005
	0.0010	0.0001	0.0007	0.0001	1.46	21.92	0.008	0.008	0.0004	0.0003
TA*Event	0.0006	0.0004 ***	-0.0022 **	0.0000	-1.77	-94.58 ***	0.057 ***	0.051 ***	0.0063 ***	0.0016 ***
	0.0010	0.0001	0.0010	0.0001	1.36	21.81	0.009	0.008	0.0004	0.0002
VIX	-0.0001	0.0001 ***	0.0004 ***	0.0001 ***	-0.27 ***	-3.91 ***	-0.007 ***	-0.018 ***	0.0004 ***	0.0004 ***
	0.0001	0.0000	0.0001	0.0000	0.06	0.98	0.000	0.000	0.0000	0.0000
Nobs	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257
R2 within	0.0457	0.0569	0.0311	0.0454	0.0246	0.0153	0.3020	0.3362	0.0383	0.0352
Wald Chi2(8)	7,413.7	8,896.4	6,078.1	6,202.8	5,317.9	5,348.2	57,954.4	69,313.0	5,962.3	5,622.6

B. Trading Activity	Volume		log Volume		Average Trade Size		Log Average Trade Size		Price
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)
Intercept	194,189 ***	5,245,935 ***	11.522 ***	14.422 ***	138.47 ***	2,750.11 ***	4.776 ***	7.676 ***	27.21 ***
	11,380	309,794	0.042	0.054	3.51	62.77	0.013	0.022	0.82
Event	68,670 ***	1,488,600 ***	0.293 ***	0.319 ***	3.40 ***	70.24 ***	0.017 ***	0.044 ***	1.54 ***
	3,595	68,233	0.004	0.005	1.25	8.32	0.002	0.002	0.02
Q*Event	-6,136	230,342 *	-0.055 ***	-0.038 ***	11.52 ***	244.97 ***	0.070 ***	0.087 ***	0.41 ***
	6,791	125,629	0.009	0.009	1.54	14.44	0.004	0.004	0.05
T*Event	-23,547 ***	-528,537 ***	-0.018	-0.012	-1.70	3.82	-0.002	0.003	-0.07
	7,426	147,321	0.011	0.011	1.49	17.73	0.005	0.005	0.06
TA*Event	4,123	-280,840 *	-0.020 *	-0.027 **	-5.09 ***	-95.13 ***	-0.040 ***	-0.046 ***	-0.07
	6,822	146,551	0.011	0.011	1.91	19.93	0.005	0.005	0.05
VIX	1,770 ***	-1,429	-0.005 ***	-0.016 ***	-0.31 ***	-28.04 ***	-0.001 ***	-0.012 ***	-0.30 ***
	527	9,961	0.001	0.001	0.11	1.07	0.000	0.000	0.00
Nobs	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257	162,257
R2 within	0.0048	0.0062	0.0395	0.0480	0.0009	0.0101	0.0091	0.0277	0.0979
Wald Chi2(8)	737.5	1,030.2	6,609.5	8,118.9	439.7	2,168.0	1,491.8	4,679.5	15,082.7

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for the U.S. tick size pilot sample stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (2)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock i on day t, Q, T and TA are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 30, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.2.7. Changes in Market Quality for Tick-Constrained and Unconstrained Stocks: Panel Regressions (Rules) that includes the last week of September

	Quoted Spread		Effective Spread		log Depth				Volatility	
A. Quote Quality	Tick Constrained	Unconstrained	Tick Constrained	Unconstrained	Tick Constrained		Unconstrained		Tick Constrained	Unconstrained
	(dollar)	(dollar)	(dollar)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	Midquote	Midquote
Intercept	0.0287 ***	0.2265 ***	0.0141 ***	0.0814 ***	2.134 ***	4.711 ***	1.602 ***	5.031 ***	0.0214 ***	0.0287 ***
	0.0006	0.0108	0.0006	0.0038	0.029	0.025	0.028	0.040	0.0006	0.0012
Event	0.0050 ***	0.0484 ***	0.0028 ***	0.0121 ***	0.018 ***	0.033 ***	0.107 ***	0.172 ***	0.0043 ***	0.0068 ***
	0.0001	0.0017	0.0002	0.0010	0.004	0.004	0.006	0.006	0.0002	0.0004
Q*Event	0.0317 ***	-0.0258 ***	0.0229 ***	0.0059 ***	1.081 ***	1.110 ***	0.306 ***	0.279 ***	0.0083 ***	-0.0031 ***
	0.0002	0.0031	0.0004	0.0018	0.009	0.009	0.013	0.012	0.0004	0.0009
T*Event	0.0002	-0.0003	0.0013 ***	0.0016	0.015	0.011	-0.054 ***	-0.034 **	0.0000	-0.0020 **
	0.0002	0.0037	0.0005	0.0023	0.012	0.012	0.015	0.014	0.0005	0.0010
TA*Event	-0.0015 ***	0.0057	-0.0034 ***	0.0001	0.099 ***	0.079 ***	0.017	0.026 *	0.0085 ***	0.0031 ***
	0.0002	0.0036	0.0005	0.0035	0.012	0.012	0.015	0.015	0.0005	0.0008
VIX	0.0000	-0.0003	0.0003 ***	0.0006 ***	-0.006 ***	-0.018 ***	-0.008 ***	-0.019 ***	0.0004 ***	0.0003 ***
	0.0000	0.0002	0.0000	0.0002	0.001	0.001	0.001	0.001	0.0000	0.0001
Nobs	79,846	42,284	79,846	42,284	79,846	79,846	42,284	42,284	79,846	42,284
R2 within	0.6412	0.0283	0.1683	0.0100	0.4564	0.4873	0.0960	0.1340	0.1135	0.0116
Wald Chi2(8)	160,481.1	1,137.3	18,624.6	566.0	56,523.7	65,284.7	4,154.1	6,204.6	7,925.4	532.7

	log Volume				log Average Trade Size				Price	
B. Trading Activity	Tick Constrained		Unconstrained		Tick Constrained		Unconstrained		Tick Constrained	Unconstrained
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)	(dollar)
Intercept	12.176 ***	14.754 ***	10.546 ***	13.971 ***	4.888 ***	7.465 ***	4.586 ***	8.010 ***	17.26 ***	43.85 ***
	0.041	0.064	0.074	0.112	0.016	0.027	0.025	0.043	0.48	2.36
Event	0.257 ***	0.273 ***	0.326 ***	0.391 ***	0.002	0.018 ***	0.025 ***	0.090 ***	0.83 ***	3.15 ***
	0.006	0.006	0.009	0.009	0.003	0.003	0.004	0.005	0.02	0.07
Q*Event	-0.055 ***	-0.026 **	-0.040 **	-0.067 ***	0.100 ***	0.129 ***	0.032 ***	0.005	0.26 ***	0.22
	0.012	0.013	0.018	0.018	0.005	0.005	0.009	0.009	0.04	0.16
T*Event	-0.033 **	-0.038 **	0.010	0.031	0.002	-0.002	0.000	0.021 *	0.22 ***	-0.50 ***
	0.015	0.016	0.021	0.022	0.007	0.007	0.010	0.011	0.05	0.17
TA*Event	0.040 ***	0.020	-0.101 ***	-0.095 ***	-0.043 ***	-0.062 ***	-0.036 ***	-0.029 ***	-0.46 ***	0.76 ***
	0.015	0.015	0.022	0.023	0.006	0.007	0.010	0.011	0.05	0.14
VIX	-0.001	-0.013 ***	-0.011 ***	-0.021 ***	-0.001	-0.012	-0.003 ***	-0.013 ***	-0.20 ***	-0.47 ***
	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.00	0.01
Nobs	79,846	79,846	42,284	42,284	79,846	79,846	42,284	42,284	79,846	42,284
R2 within	0.0342	0.0385	0.0475	0.0655	0.0154	0.0333	0.0039	0.0256	0.1002	0.1318
Wald Chi2(8)	2,795.7	3,177.5	2,124.2	2,978.7	1,227.7	2781.3	173.3	1,142.4	7,924.8	5,707.0

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for tick-constrained and unconstrained U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. Tick-constrained stocks are those with an average quoted spread of $0.05 or less and unconstrained stocks are those with an average quoted spread of $0.10 or more in the pre-pilot period. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (2)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock *i* on day *t*, *Q*, *T* and *TA* are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 30, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.2.10. Changes in the Term Structure of Liquidity Provision and Price Impacts: Panel Regressions (Rules) that includes the last week of September

A. Realized Spread	30 second horizon	1 minute horizon	2 minute horizon	3 minute horizon	4 minute horizon	5 minute horizon
Intercept	0.0133 ***	0.0118 ***	0.0107 ***	0.0100 ***	0.0097 ***	0.0095 ***
	0.0011	0.0010	0.0010	0.0010	0.0010	0.0010
Event	0.0011 ***	0.0010 ***	0.0007 ***	0.0006 **	0.0005 *	0.0006 **
	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
Q*Event	0.0080 ***	0.0077 ***	0.0077 ***	0.0074 ***	0.0074 ***	0.0070 ***
	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
T*Event	0.0011 *	0.0010	0.0008	0.0008	0.0007	0.0009
	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007
TA*Event	-0.0031 ***	-0.0028 ***	-0.0029 ***	-0.0028 ***	-0.0025 ***	-0.0026 ***
	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008
VIX	0.0004 ***	0.0004 ***	0.0004 ***	0.0004 ***	0.0005 ***	0.0005 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nobs	162,256	162,256	162,256	162,256	162,256	162,256
R2 within	0.0092	0.0083	0.0069	0.0062	0.0057	0.0053
Wald Chi2 (8)	1,295.7	1,165.3	963.2	875.7	802.9	752.1

B. Price Impact	30 second horizon	1 minute horizon	2 minute horizon	3 minute horizon	4 minute horizon	5 minute horizon
Intercept	0.0097 ***	0.0105 ***	0.0110 ***	0.0114 ***	0.0115 ***	0.0116 ***
	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004
Event	0.0018 ***	0.0018 ***	0.0020 ***	0.0020 ***	0.0021 ***	0.0020 ***
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Q*Event	0.0044 ***	0.0046 ***	0.0046 ***	0.0047 ***	0.0047 ***	0.0049 ***
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
T*Event	0.0007 ***	0.0007 ***	0.0008 ***	0.0008 ***	0.0008 ***	0.0008 ***
	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
TA*Event	0.0003	0.0001	0.0001	0.0001	0.0000	0.0000
	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
VIX	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nobs	162,256	162,256	162,256	162,256	162,256	162,256
R2 within	0.0468	0.0397	0.0349	0.0319	0.0294	0.0270
Wald Chi2 (8)	6,972.4	5,974.5	5,137.4	4,726.0	4,352.5	4,005.1

This table reports the results from difference-in-difference panel regressions that test for changes in the term structure of liquidity provision and price discovery for U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (2)$$

where $MQ_{i,t}$ is a market quality measure (realized spread, price impact) for stock i on day t, Q, T and TA are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 30, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons. The estimated coefficients for the rule dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.2.11. Changes in the Term Structure of Liquidity Provision and Price Impacts for Tick-Constrained and Unconstrained Stocks: Panel Regressions (Rules) that includes the last week of September

A. Realized Spread	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained
Intercept	0.0016 ***	0.0392 ***	0.0010 **	0.0356 ***	0.0010 **	0.0318 ***	0.0010 **	0.0293 ***	0.0012 **	0.0280 ***	0.0012 **	0.0270 ***
	0.0005	0.0031	0.0005	0.0030	0.0005	0.0031	0.0005	0.0030	0.0005	0.0030	0.0005	0.0030
Event	0.0011 ***	0.0017 **	0.0011 ***	0.0015 *	0.0010 ***	0.0006	0.0010 ***	0.0003	0.0011 ***	-0.0002	0.0011 ***	0.0001
	0.0002	0.0008	0.0002	0.0008	0.0002	0.0009	0.0002	0.0009	0.0002	0.0009	0.0002	0.0009
Q*Event	0.0111 ***	0.0012	0.0107 ***	0.0012	0.0103 ***	0.0022	0.0098 ***	0.0025	0.0096 ***	0.0031 *	0.0094 ***	0.0023
	0.0004	0.0015	0.0004	0.0016	0.0004	0.0016	0.0004	0.0016	0.0004	0.0017	0.0004	0.0017
T*Event	0.0004	0.0013	0.0002	0.0014	0.0000	0.0009	0.0002	0.0004	0.0002	-0.0003	0.0002	0.0001
	0.0004	0.0021	0.0005	0.0021	0.0005	0.0022	0.0005	0.0022	0.0005	0.0023	0.0005	0.0023
TA*Event	-0.0029 ***	-0.0033	-0.0025 ***	-0.0034	-0.0022 ***	-0.0040 *	-0.0020 ***	-0.0044 *	-0.0019 ***	-0.0036	-0.0019 ***	-0.0039
	0.0004	0.0022	0.0004	0.0022	0.0005	0.0023	0.0005	0.0023	0.0005	0.0024	0.0005	0.0024
VIX	0.0003 ***	0.0006 ***	0.0003 ***	0.0007 ***	0.0003 ***	0.0008 ***	0.0003 ***	0.0009 ***	0.0003 ***	0.0009 ***	0.0003 ***	0.0010 ***
	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
Nobs	79,846	42,283	79,846	42,283	79,846	42,283	79,846	42,283	79,846	42,283	79,846	42,283
R2 within	0.0573	0.0013	0.0489	0.0012	0.0407	0.0012	0.0356	0.0014	0.0327	0.0014	0.0300	0.0013
Wald Chi2 (8)	4,919.6	44.6	4,033.6	44.6	3,355.5	44.2	2,922.8	50.6	2,699.9	51.5	2,462.8	51.2

B. Price Impact	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained
Intercept	0.0053 ***	0.0181 ***	0.0056 ***	0.0199 ***	0.0055 ***	0.0218 ***	0.0055 ***	0.0231 ***	0.0055 ***	0.0238 ***	0.0055 ***	0.0242 ***
	0.0001	0.0009	0.0001	0.0010	0.0002	0.0010	0.0002	0.0011	0.0002	0.0011	0.0002	0.0011
Event	0.0006 ***	0.0045 ***	0.0006 ***	0.0046 ***	0.0007 ***	0.0051 ***	0.0007 ***	0.0053 ***	0.0007 ***	0.0055 ***	0.0006 ***	0.0053 ***
	0.0000	0.0003	0.0000	0.0003	0.0001	0.0003	0.0001	0.0004	0.0001	0.0004	0.0001	0.0004
Q*Event	0.0057 ***	0.0019 ***	0.0059 ***	0.0019 ***	0.0061 ***	0.0014 **	0.0064 ***	0.0012 *	0.0065 ***	0.0010	0.0066 ***	0.0013 *
	0.0001	0.0005	0.0001	0.0006	0.0001	0.0006	0.0001	0.0007	0.0001	0.0007	0.0002	0.0007
T*Event	0.0006 ***	0.0009	0.0007 ***	0.0008	0.0008 ***	0.0011	0.0007 ***	0.0013	0.0007 ***	0.0017 *	0.0007 ***	0.0015
	0.0001	0.0007	0.0001	0.0007	0.0002	0.0008	0.0002	0.0009	0.0002	0.0009	0.0002	0.0010
TA*Event	-0.0004 ***	0.0020 ***	-0.0006 ***	0.0020 **	-0.0007 ***	0.0023 ***	-0.0009 ***	0.0025 ***	-0.0009 ***	0.0022 **	-0.0009 ***	0.0023 **
	0.0001	0.0007	0.0001	0.0008	0.0002	0.0009	0.0002	0.0009	0.0002	0.0010	0.0002	0.0010
VIX	0.0000 ***	-0.0001 ***	0.0000 ***	-0.0002 ***	0.0000 **	-0.0002 ***	0.0000	-0.0003 ***	0.0000	-0.0003 ***	0.0000	-0.0003 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
Nobs	79,846	42,283	79,846	42,283	79,846	42,283	79,846	42,283	79,846	42,283	79,846	42,283
R2 within	0.2092	0.0268	0.1853	0.0223	0.1653	0.0201	0.1480	0.0187	0.1334	0.0176	0.1188	0.0162
Wald Chi2 (8)	17,119.9	1,059.8	15,375.0	884.2	12,975.8	788.9	11,501.7	726.3	10,363.5	682.0	9,059.9	621.8

This table reports the results from difference-in-difference panel regressions that test for changes in the term structure of liquidity provision and price impacts for U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. Tick-constrained stocks are those with an average quoted spread of $0.05 or less and unconstrained stocks are those with an average quoted spread of $0.10 or more in the pre-pilot period. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \qquad (2)$$

where $MQ_{i,t}$ is a market quality measure (realized spread, price impact) for stock *i* on day *t*, *Q*, *T* and *TA* are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 30, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons. The estimated coefficients for the rule dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.3.3. Changes in Market Quality: Panel Regressions (Groups) that Excludes the Election

A. Quote Quality	Quoted Spread		Effective Spread		Depth		log Depth		Volatility	
	(dollar)	(%)	(dollar)	(%)	(shares)	(dollar)	(shares)	(dollar)	quote upd.	5min
Intercept	0.0922 ***	0.0047 ***	0.0365 ***	0.0020 ***	11.76 ***	171.80 ***	1.882 ***	4.782 ***	0.0249 ***	0.0187 ***
	0.0042	0.0002	0.0014	0.0001	1.06	14.92	0.020	0.019	0.0005	0.0004
Event	0.0148 ***	0.0004 ***	0.0044 ***	0.0001 ***	1.88 ***	23.41 ***	0.066 ***	0.095 ***	0.0037 ***	0.0038 ***
	0.0004	0.0000	0.0003	0.0000	0.25	2.64	0.003	0.003	0.0002	0.0001
G1*Event	0.0137 ***	0.0022 ***	0.0175 ***	0.0018 ***	22.14 ***	187.82 ***	0.762 ***	0.778 ***	0.0023 ***	0.0006 *
	0.0009	0.0001	0.0006	0.0001	0.89	6.89	0.007	0.007	0.0003	0.0003
G2*Event	0.0146 ***	0.0018 ***	0.0189 ***	0.0018 ***	22.87 ***	301.53 ***	0.754 ***	0.776 ***	0.0018 ***	0.0001
	0.0009	0.0001	0.0007	0.0000	1.26	21.20	0.007	0.007	0.0003	0.0002
G3*Event	0.0151 ***	0.0023 ***	0.0167 ***	0.0018 ***	21.93 ***	216.55 ***	0.817 ***	0.832 ***	0.0082 ***	0.0016 ***
	0.0008	0.0001	0.0009	0.0001	0.66	6.33	0.007	0.007	0.0003	0.0002
VIX	-0.0001 **	0.0001 ***	0.0003 ***	0.0001 ***	-0.26 ***	-3.85 ***	-0.007 ***	-0.018 ***	0.0003 ***	0.0003 ***
	0.0001	0.0000	0.0001	0.0000	0.07	1.01	0.001	0.000	0.0000	0.0000
Nobs	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313
R2 within	0.039	0.051	0.027	0.043	0.028	0.018	0.305	0.342	0.027	0.024
Wald Chi2(8)	5,810.8	7,254.5	4,960.1	5,374.5	4,901.5	4,994.0	53,195.4	64,963.6	3,731.6	3,313.9

B. Trading Activity	Volume		log Volume		Average Trade Size		Log Average Trade Size		Price
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)
Intercept	198,265 ***	5,352,611 ***	11.538 ***	14.436 ***	138.64 ***	2,750.36 ***	4.777 ***	7.675 ***	27.17 ***
	11,263	304,479	0.042	0.054	3.48	62.86	0.013	0.022	0.82
Event	60,334 ***	1,240,665 ***	0.257 ***	0.286 ***	3.30 ***	69.17 ***	0.014 ***	0.043 ***	1.62 ***
	3,931	71,918	0.005	0.005	1.27	8.51	0.002	0.002	0.02
G1*Event	-9,252	216,103	-0.056 ***	-0.038 ***	11.06 ***	245.11 ***	0.070 ***	0.087 ***	0.41 ***
	7,305	132,062	0.009	0.009	1.58	15.01	0.004	0.004	0.05
G2*Event	-34,103 ***	-325,627 **	-0.077 ***	-0.054 ***	9.58 ***	258.11 ***	0.068 ***	0.091 ***	0.36 ***
	5,864	127,392	0.009	0.010	1.78	16.63	0.004	0.004	0.05
G3*Event	-26,064 ***	-522,466 ***	-0.092 ***	-0.075 ***	4.58 **	158.50 ***	0.026 ***	0.043 ***	0.29 ***
	6,608	130,479	0.009	0.009	2.04	18.43	0.004	0.004	0.05
VIX	1,479 ***	-9,090	-0.006 ***	-0.017 ***	-0.32 ***	-27.98 ***	-0.001 ***	-0.012 ***	-0.30 ***
	530	10,013	0.001	0.001	0.12	1.07	0.000	0.000	0.00
Nobs	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313
R2 within	0.003	0.004	0.029	0.038	0.001	0.010	0.008	0.028	0.104
Wald Chi2(8)	458.4	636.6	4,527.2	6,004.6	379.4	2,038.4	1,242.2	4,421.8	14,456.3

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for the U.S. tick size pilot sample stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot G1 + \beta_2 \cdot G2 + \beta_3 \cdot G3 + \beta_4 \cdot Event + \beta_5 \cdot G1 \cdot Event + \beta_6 \cdot G2 \cdot Event + \beta_7 \cdot G3 \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \qquad (1)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock *i* on day *t*, *G1*, *G2* and *G3* are dummies that take on a value of one for stocks belonging to the respective test groups, *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Furthermore, the week of the Presidential election, November 9-15, 2016, is excluded. Control stocks are those that will continue being quoted and traded in decimals, G1 stocks will be subject to the quote rule, G2 stocks to the quote and the trade rules, and G3 stocks to the quote, trade, and trade-at rules. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.3.4. Changes in Market Quality: Panel Regressions (Rules) that Excludes the Election

A. Quote Quality	Quoted Spread		Effective Spread		Depth		log Depth		Volatility	
	(dollar)	(%)	(dollar)	(%)	(shares)	(dollar)	(shares)	(dollar)	Midquote	5min
Intercept	0.0922 ***	0.0047 ***	0.0365 ***	0.0020 ***	11.76 ***	171.80 ***	1.882 ***	4.782 ***	0.0249 ***	0.0187 ***
	0.0042	0.0002	0.0014	0.0001	1.06	14.92	0.020	0.019	0.0005	0.0004
Event	0.0148 ***	0.0004 ***	0.0044 ***	0.0001 ***	1.88 ***	23.41 ***	0.066 ***	0.095 ***	0.0037 ***	0.0038 ***
	0.0004	0.0000	0.0003	0.0000	0.25	2.64	0.003	0.003	0.0002	0.0001
Q*Event	0.0137 ***	0.0022 ***	0.0175 ***	0.0018 ***	22.14 ***	187.82 ***	0.762 ***	0.778 ***	0.0023 ***	0.0006 *
	0.0009	0.0001	0.0006	0.0001	0.89	6.89	0.007	0.007	0.0003	0.0003
T*Event	0.0009	-0.0004 ***	0.0014 *	-0.0001	0.73	113.71 ***	-0.008	-0.002	-0.0005	-0.0005
	0.0011	0.0001	0.0008	0.0001	1.51	22.03	0.009	0.009	0.0004	0.0003
TA*Event	0.0006	0.0004 ***	-0.0022 **	0.0000	-0.94	-84.98 ***	0.063 ***	0.056 ***	0.0064 ***	0.0015 ***
	0.0010	0.0001	0.0011	0.0001	1.39	21.86	0.009	0.009	0.0004	0.0002
VIX	-0.0001 **	0.0001 ***	0.0003 ***	0.0001 ***	-0.26 ***	-3.85 ***	-0.007 ***	-0.018 ***	0.0003 ***	0.0003 ***
	0.0001	0.0000	0.0001	0.0000	0.07	1.01	0.001	0.000	0.0000	0.0000
Nobs	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313
R2 within	0.0393	0.0509	0.0274	0.0429	0.0275	0.0180	0.3050	0.3422	0.0266	0.0235
Wald Chi2(8)	5,810.8	7,254.5	4,960.1	5,374.5	4,901.5	4,994.0	53,195.4	64,963.6	3,731.6	3,313.9

B. Trading Activity	Volume		log Volume		Average Trade Size		Log Average Trade Size		Price
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)
Intercept	198,265 ***	5,352,611 ***	11.538 ***	14.436 ***	138.64 ***	2,750.36 ***	4.777 ***	7.675 ***	27.17 ***
	11,263	304,479	0.042	0.054	3.48	62.86	0.013	0.022	0.82
Event	60,334 ***	1,240,665 ***	0.257 ***	0.286 ***	3.30 ***	69.17 ***	0.014 ***	0.043 ***	1.62 ***
	3,931	71,918	0.005	0.005	1.27	8.51	0.002	0.002	0.02
Q*Event	-9,252	216,103	-0.056 ***	-0.038 ***	11.06 ***	245.11 ***	0.070 ***	0.087 ***	0.41 ***
	7,305	132,062	0.009	0.009	1.58	15.01	0.004	0.004	0.05
T*Event	-24,851 ***	-541,730 ***	-0.022 *	-0.016	-1.48	13.00	-0.002	0.004	-0.05
	7,621	153,531	0.011	0.012	1.57	18.92	0.005	0.005	0.06
TA*Event	8,039	-196,840	-0.015	-0.022 *	-5.00 **	-99.61 ***	-0.042 ***	-0.048 ***	-0.08
	6,955	152,161	0.011	0.012	2.04	21.73	0.005	0.005	0.06
VIX	1,479 ***	-9,090	-0.006 ***	-0.017 ***	-0.32 ***	-27.98 ***	-0.001 ***	-0.012 ***	-0.30 ***
	530	10,013	0.001	0.001	0.12	1.07	0.000	0.000	0.00
Nobs	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313	152,313
R2 within	0.0034	0.0042	0.0292	0.0385	0.0008	0.0101	0.0081	0.0280	0.1041
Wald Chi2(8)	458.4	636.6	4,527.2	6,004.6	379.4	2,038.4	1,242.2	4,421.8	14,456.3

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for the U.S. tick size pilot sample stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (2)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock *i* on day *t*, *Q*, *T* and *TA* are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Furthermore, the week of the Presidential election, November 9-15, 2016, is excluded. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.3.7. Changes in Market Quality for Tick-Constrained and Unconstrained Stocks: Panel Regressions (Rules) that Excludes the Election

	Quoted Spread		Effective Spread		log Depth				Volatility	
A. Quote Quality	Tick Constrained	Unconstrained	Tick Constrained	Unconstrained	Tick Constrained		Unconstrained		Tick Constrained	Unconstrained
	(dollar)	(dollar)	(dollar)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	Midquote	Midquote
Intercept	0.0289 ***	0.2269 ***	0.0143 ***	0.0814 ***	2.130 ***	4.706 ***	1.604 ***	5.031 ***	0.0220 ***	0.0294 ***
	0.0006	0.0108	0.0006	0.0037	0.029	0.025	0.028	0.040	0.0006	0.0011
Event	0.0042 ***	0.0424 ***	0.0024 ***	0.0101 ***	0.027 ***	0.045 ***	0.104 ***	0.172 ***	0.0031 ***	0.0051 ***
	0.0001	0.0017	0.0002	0.0010	0.004	0.004	0.006	0.006	0.0002	0.0004
Q*Event	0.0319 ***	-0.0282 ***	0.0231 ***	0.0062 ***	1.084 ***	1.114 ***	0.304 ***	0.278 ***	0.0074 ***	-0.0032 ***
	0.0002	0.0032	0.0004	0.0019	0.010	0.009	0.013	0.012	0.0004	0.0009
T*Event	0.0002	0.0013	0.0010 **	0.0007	0.012	0.008	-0.046 ***	-0.026 *	0.0001	-0.0019 *
	0.0002	0.0038	0.0005	0.0025	0.013	0.012	0.016	0.015	0.0005	0.0010
TA*Event	-0.0015 ***	0.0050	-0.0031 ***	-0.0003	0.108 ***	0.088 ***	0.018	0.025	0.0084 ***	0.0031 ***
	0.0002	0.0037	0.0005	0.0036	0.013	0.012	0.015	0.015	0.0005	0.0008
VIX	0.0000 *	-0.0004 *	0.0003 ***	0.0005 ***	-0.006 ***	-0.018 ***	-0.008 ***	-0.019 ***	0.0003 ***	0.0003 ***
	0.0000	0.0002	0.0000	0.0002	0.001	0.001	0.001	0.001	0.0000	0.0001
Nobs	74,975	39,673	74,975	39,673	74,975	74,975	39,673	39,673	74,975	39,673
R2 within	0.6417	0.0212	0.1618	0.0073	0.4599	0.4936	0.0953	0.1359	0.0935	0.0064
Wald Chi2(8)	150,217.3	767.6	17,455.9	388.8	52,120.5	61,142.1	3,773.6	5,819.0	5,698.3	268.2

	log Volume				log Average Trade Size				Price	
B. Trading Activity	Tick Constrained		Unconstrained		Tick Constrained		Unconstrained		Tick Constrained	Unconstrained
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)	(dollar)
Intercept	12.190 ***	14.766 ***	10.569 ***	13.992 ***	4.887 ***	7.464 ***	4.591 ***	8.013 ***	17.24 ***	43.79 ***
	0.041	0.064	0.074	0.111	0.016	0.027	0.025	0.043	0.48	2.39
Event	0.223 ***	0.241 ***	0.284 ***	0.351 ***	0.000	0.019 ***	0.018 ***	0.086 ***	0.89 ***	3.26 ***
	0.006	0.007	0.009	0.010	0.003	0.003	0.005	0.005	0.02	0.07
Q*Event	-0.058 ***	-0.027 **	-0.041 **	-0.068 ***	0.102 ***	0.132 ***	0.027 ***	0.000	0.27 ***	0.22
	0.013	0.013	0.018	0.019	0.005	0.006	0.009	0.009	0.04	0.17
T*Event	-0.038 **	-0.042 ***	0.017	0.040 *	0.000	-0.005	0.006	0.029 ***	0.24 ***	-0.46 **
	0.016	0.016	0.022	0.023	0.007	0.007	0.011	0.011	0.05	0.19
TA*Event	0.047 ***	0.027 *	-0.101 ***	-0.096 ***	-0.041 ***	-0.061 ***	-0.039 ***	-0.033 ***	-0.48 ***	0.77 ***
	0.015	0.016	0.023	0.024	0.007	0.007	0.011	0.011	0.05	0.15
VIX	-0.002 **	-0.014 ***	-0.012 ***	-0.022 ***	-0.001	-0.012 ***	-0.003 ***	-0.013 ***	-0.20 ***	-0.46 ***
	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.00	0.01
Nobs	74,975	74,975	39,673	39,673	74,975	74,975	39,673	39,673	74,975	39,673
R2 within	0.0241	0.0296	0.0359	0.0539	0.0147	0.0345	0.0027	0.0241	0.1078	0.1381
Wald Chi2(8)	1,831.8	2,261.4	1,482.9	2,254.5	1,093.6	2,686.7	112.8	1,013.1	7,682.3	5,423.9

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for tick-constrained and unconstrained U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. Tick-constrained stocks are those with an average quoted spread of $0.05 or less and unconstrained stocks are those with an average quoted spread of $0.10 or more in the pre-pilot period. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \qquad (2)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock *i* on day *t*, *Q*, *T* and *TA* are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Furthermore, the week of the Presidential election, November 9-15, 2016, is excluded. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.3.10. Changes in the Term Structure of Liquidity Provision and Price Impacts: Panel Regressions (Rules) that Excludes the Election

A. Realized Spread	30 second horizon	1 minute horizon	2 minute horizon	3 minute horizon	4 minute horizon	5 minute horizon
Intercept	0.0131 ***	0.0116 ***	0.0105 ***	0.0098 ***	0.0095 ***	0.0093 ***
	0.0011	0.0010	0.0010	0.0010	0.0010	0.0010
Event	0.0008 ***	0.0008 ***	0.0005 ***	0.0005 ***	0.0004 ***	0.0005 ***
	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003
Q*Event	0.0082 ***	0.0078 ***	0.0077 **	0.0075 *	0.0073	0.0070 *
	0.0005	0.0005	0.0005	0.0005	0.0006	0.0006
T*Event	0.0008	0.0007	0.0005	0.0006	0.0006	0.0008
	0.0007	0.0007	0.0007	0.0007	0.0008	0.0008
TA*Event	-0.0031 ***	-0.0028 ***	-0.0028 ***	-0.0029 ***	-0.0026 ***	-0.0027 ***
	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008
VIX	0.0004 ***	0.0004 ***	0.0004 ***	0.0004 ***	0.0005 ***	0.0005 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nobs	152,312	152,312	152,312	152,312	152,312	152,312
R2 within	0.0087	0.0078	0.0066	0.0060	0.0055	0.0052
Wald Chi2 (8)	1,101.9	982.7	823.5	763.5	707.3	663.8

B. Price Impact	30 second horizon	1 minute horizon	2 minute horizon	3 minute horizon	4 minute horizon	5 minute horizon
Intercept	0.0099 ***	0.0106 ***	0.0112 ***	0.0115 ***	0.0117 ***	0.0118 ***
	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Event	0.0016 ***	0.0016 ***	0.0017 ***	0.0017 ***	0.0018 ***	0.0017 ***
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Q*Event	0.0044 ***	0.0046 ***	0.0046 ***	0.0047 ***	0.0048 ***	0.0050 ***
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
T*Event	0.0007 ***	0.0007 ***	0.0008 ***	0.0008 ***	0.0008 ***	0.0007 **
	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
TA*Event	0.0003	0.0001	0.0001	0.0002	0.0000	0.0001
	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003
VIX	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nobs	152,312	152,312	152,312	152,312	152,312	152,312
R2 within	0.0443	0.0374	0.0328	0.0298	0.0275	0.0253
Wald Chi2 (8)	5,796.0	4,959.4	4,269.0	3,921.9	3,639.2	3,350.7

This table reports the results from difference-in-difference panel regressions that test for changes in the term structure of liquidity provision and price discovery for U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (2)$$

where $MQ_{i,t}$ is a market quality measure (realized spread, price impact) for stock i on day t, Q, T and TA are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Furthermore, the week of the Presidential election, November 9-15, 2016, is excluded. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons. The estimated coefficients for the rule dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.3.11. Changes in the Term Structure of Liquidity Provision and Price Impacts for Tick-Constrained and Unconstrained Stocks: Panel Regressions (Rules) that Excludes the Election

A. Realized Spread	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained
Intercept	0.0016 ***	0.0386 ***	0.0010 **	0.0349 ***	0.0010 **	0.0311 ***	0.0010 **	0.0287 ***	0.0012 **	0.0274 ***	0.0012 **	0.0264 ***
	0.0005	0.0030	0.0005	0.0029	0.0005	0.0030	0.0005	0.0029	0.0005	0.0030	0.0005	0.0029
Event	0.0010 ***	0.0012	0.0010 ***	0.0010	0.0009 ***	0.0003	0.0010 ***	0.0002	0.0010 ***	-0.0003	0.0011 ***	0.0001
	0.0002	0.0008	0.0002	0.0009	0.0002	0.0009	0.0002	0.0009	0.0002	0.0009	0.0002	0.0010
Q*Event	0.0113 ***	0.0016	0.0109 ***	0.0015	0.0105 ***	0.0022	0.0100 ***	0.0024	0.0098 ***	0.0028	0.0095 ***	0.0020
	0.0004	0.0016	0.0004	0.0016	0.0004	0.0017	0.0004	0.0017	0.0004	0.0018	0.0005	0.0018
T*Event	0.0002	0.0004	0.0000	0.0005	-0.0002	0.0001	0.0000	-0.0001	0.0000	-0.0004	0.0001	0.0001
	0.0005	0.0022	0.0005	0.0022	0.0005	0.0023	0.0005	0.0023	0.0005	0.0024	0.0005	0.0024
TA*Event	-0.0028 ***	-0.0034	-0.0023 ***	-0.0034	-0.0020 ***	-0.0040 *	-0.0017 ***	-0.0046 *	-0.0017 ***	-0.0042 *	-0.0017 ***	-0.0045 *
	0.0004	0.0023	0.0005	0.0024	0.0005	0.0024	0.0005	0.0024	0.0005	0.0025	0.0005	0.0025
VIX	0.0003 ***	0.0006 ***	0.0003 ***	0.0007 ***	0.0003 ***	0.0008 ***	0.0003 ***	0.0009 ***	0.0003 ***	0.0009 ***	0.0003 ***	0.0010 ***
	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
Nobs	74,975	39,672	74,975	39,672	74,975	39,672	74,975	39,672	74,975	39,672	74,975	39,672
R2 within	0.0566	0.0010	0.0486	0.0011	0.0408	0.0012	0.0358	0.0014	0.0330	0.0014	0.0301	0.0014
Wald Chi2 (8)	4,651.5	34.8	3,925.0	35.7	3,258.7	39.6	2,851.2	48.4	2,622.5	50.3	2,352.3	50.9

B. Price Impact	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained	Tick constrained	Unconstrained
Intercept	0.0053 ***	0.0184 ***	0.0056 ***	0.0202 ***	0.0056 ***	0.0221 ***	0.0056 ***	0.0234 ***	0.0055 ***	0.0241 ***	0.0055 ***	0.0245 ***
	0.0001	0.0009	0.0001	0.0010	0.0002	0.0010	0.0002	0.0011	0.0002	0.0011	0.0002	0.0011
Event	0.0005 ***	0.0040 ***	0.0005 ***	0.0041 ***	0.0006 ***	0.0045 ***	0.0006 ***	0.0045 ***	0.0005 ***	0.0047 ***	0.0005 ***	0.0045 ***
	0.0000	0.0003	0.0001	0.0003	0.0001	0.0003	0.0001	0.0004	0.0001	0.0004	0.0001	0.0004
Q*Event	0.0057 ***	0.0017 ***	0.0059 ***	0.0018 ***	0.0061 ***	0.0014 **	0.0064 ***	0.0012 *	0.0065 ***	0.0011	0.0066 ***	0.0015 *
	0.0001	0.0005	0.0001	0.0006	0.0001	0.0007	0.0001	0.0007	0.0001	0.0007	0.0002	0.0008
T*Event	0.0006 ***	0.0012 *	0.0007 ***	0.0011	0.0008 ***	0.0013	0.0007 ***	0.0014	0.0007 ***	0.0015	0.0006 ***	0.0013
	0.0001	0.0007	0.0002	0.0008	0.0002	0.0009	0.0002	0.0009	0.0002	0.0009	0.0002	0.0010
TA*Event	-0.0004 ***	0.0019 **	-0.0006 ***	0.0018 **	-0.0008 ***	0.0022 **	-0.0009 ***	0.0025 **	-0.0009 ***	0.0023 **	-0.0009 ***	0.0024 **
	0.0001	0.0007	0.0001	0.0008	0.0002	0.0009	0.0002	0.0010	0.0002	0.0010	0.0002	0.0011
VIX	0.0000 ***	-0.0002 ***	0.0000 ***	-0.0002 ***	0.0000 **	-0.0002 ***	0.0000 *	-0.0003 ***	0.0000	-0.0003 ***	0.0000	-0.0003 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
Nobs	74,975	39,672	74,975	39,672	74,975	39,672	74,975	39,672	74,975	39,672	74,975	39,672
R2 within	0.2032	0.0235	0.1793	0.0193	0.1608	0.0173	0.1442	0.0159	0.1299	0.0150	0.1157	0.0137
Wald Chi2 (8)	14,591.3	820.8	13,049.4	675.3	11,118.1	601.5	9,907.9	545.1	8,941.6	516.3	7,824.4	465.2

This table reports the results from difference-in-difference panel regressions that test for changes in the term structure of liquidity provision and price impacts for U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. Tick-constrained stocks are those with an average quoted spread of $0.05 or less and unconstrained stocks are those with an average quoted spread of $0.10 or more in the pre-pilot period. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (2)$$

where $MQ_{i,t}$ is a market quality measure (realized spread, price impact) for stock i on day t, Q, T and TA are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Furthermore, the week of the Presidential election, November 9-15, 2016, is excluded. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons. The estimated coefficients for the rule dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.4.6. Descriptive Statistics: Tick-Constrained and Unconstrained Stocks with Q1 and Q4

I. Tick-Constrained (Q1)		Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Firm Characteristics									
Market Capitalization	('000 dollar)	771,240	691,246	748,948	675,235	766,417	699,489	746,582	669,074
Price	(dollar)	11.34	8.18	11.17	7.83	11.01	7.04	11.40	7.85
Nfirms		243		86		75		103	
B. Quote Condition									
Quoted Spread	(dollar)	0.0189	0.0063	0.0190	0.0067	0.0183	0.0065	0.0194	0.0063
Effective Spread	(dollar)	0.0136	0.0141	0.0135	0.0100	0.0127	0.0091	0.0138	0.0138
Depth	(100 shares)	14.55	24.24	15.73	18.12	14.38	11.93	14.37	17.57
Volatility	(midquote)	0.0254	0.0166	0.0252	0.0193	0.0251	0.0158	0.0253	0.0152
C. Trading Activity									
Volume	(shares)	413,959	510,806	438,541	501,396	456,903	679,190	411,410	543,930
Average Trade Size	(shares)	158.54	184.44	157.90	78.78	149.00	101.27	159.61	72.77
Nobs		9,473		3,354		2,925		4,017	

II. Unconstrained (Q4)		Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Firm Characteristics									
Market Capitalization	('000 dollar)	715,554	721,210	737,013	683,162	704,772	712,922	625,586	596,156
Price	(dollar)	38.65	29.87	41.79	32.52	38.69	30.92	36.83	28.43
Nfirms		237		89		92		89	
B. Quote Condition									
Quoted Spread	(dollar)	0.2157	0.1676	0.2186	0.1587	0.2199	0.1681	0.2137	0.1526
Effective Spread	(dollar)	0.0871	0.0775	0.0866	0.0686	0.0925	0.0901	0.0910	0.1895
Depth	(100 shares)	5.23	6.05	5.00	4.91	5.65	13.33	5.77	7.71
Volatility	(midquote)	0.0323	0.0250	0.0322	0.0255	0.0333	0.0338	0.0343	0.0294
C. Trading Activity									
Volume	(shares)	89,388	175,805	77,305	152,716	82,023	192,787	82,845	296,434
Average Trade Size	(shares)	103.47	88.43	102.07	57.69	104.17	80.07	107.29	81.77
Nobs		8,567		3,259		3,290		3,248	

This table summarizes descriptive statistics for the U.S. tick size pilot sample based on data from the period August 1 – September 23, 2016, for tick-constrained stocks Panel I and unconstrained stocks in Panel II. Tick-constrained stocks are those that have an average pre-event quoted spread in the first quartile (Q1) and unconstrained stocks are those that have an average pre-event quoted spread in the fourth quartile (Q4) during the pre-pilot period. Control stocks are those that will continue being quoted and traded in decimals, G1 stocks will be subject to the quote rule, G2 stocks to the quote and the trade rules, and G3 stocks to the quote, trade, and trade-at rules. Data was drawn from TRTH and CRSP data bases. Market capitalization as of June 20, 2016, is measured in $1,000 dollars and Price is the stock price in dollars, both variables from CRSP. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars, Depth denotes the time-weighted NBBO depth, and is reported in round lots of 100 shares and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares while Average Trade Size is measured during continuous trading only.

Table IA.4.7. Changes in Market Quality for Tick-Constrained and Unconstrained Stocks: Panel Regressions (Rules) with Q1 and Q4

	Quoted Spread		Effective Spread		log Depth				Volatility	
A. Quote Quality	Q1	Q4	Q1	Q4	Q1		Q4		Q1	Q4
	(dollar)	(dollar)	(dollar)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	Midquote	Midquote
Intercept	0.0185 ***	0.2421 ***	0.0104 ***	0.0857 ***	2.478 ***	4.823 ***	1.585 ***	5.095 ***	0.0217 ***	0.0283 ***
	0.0004	0.0117	0.0005	0.0040	0.041	0.038	0.029	0.040	0.0008	0.0012
Event	0.0030 ***	0.0534 ***	0.0015 ***	0.0129 ***	0.000	-0.009	0.102 ***	0.173 ***	0.0041 ***	0.0068 ***
	0.0001	0.0019	0.0002	0.0011	0.006	0.006	0.006	0.006	0.0002	0.0004
Q*Event	0.0350 ***	-0.0270 ***	0.0252 ***	0.0062 ***	1.182 ***	1.223 ***	0.277 ***	0.255 ***	0.0126 ***	-0.0037 ***
	0.0002	0.0035	0.0004	0.0019	0.013	0.012	0.013	0.012	0.0005	0.0010
T*Event	0.0002	-0.0030	0.0015 ***	0.0010	0.034 **	-0.008	-0.031 **	-0.015	0.0008	-0.0015
	0.0002	0.0041	0.0005	0.0025	0.017	0.015	0.015	0.015	0.0007	0.0011
TA*Event	-0.0015 ***	0.0059	-0.0035 ***	-0.0016	0.097 ***	0.126 ***	0.001	0.018	0.0077 ***	0.0031 ***
	0.0002	0.0040	0.0005	0.0041	0.016	0.015	0.016	0.016	0.0007	0.0009
VIX	0.0000 **	-0.0006 **	0.0002 ***	0.0005 ***	-0.007 ***	-0.018 ***	-0.008 ***	-0.019 ***	0.0003 ***	0.0003 ***
	0.0000	0.0003	0.0000	0.0002	0.001	0.001	0.001	0.001	0.0000	0.0001
Nobs	39,029	36,243	39,029	36,243	39,029	39,029	36,243	36,243	39,029	36,243
R2 within	0.8480	0.0305	0.3061	0.0095	0.4993	0.5335	0.0896	0.1355	0.1739	0.0105
Wald Chi2(8)	266,769.3	1,073.0	19,604.8	488.5	37,006.0	44,074.2	3,344.9	5,412.5	7,274.9	432.0

	log Volume				log Average Trade Size				Price	
B. Trading Activity	Q1		Q4		Q1		Q4		Q1	Q4
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)	(dollar)
Intercept	12.555 ***	14.900 ***	10.529 ***	14.034 ***	4.990 ***	7.335 ***	4.567 ***	8.072 ***	13.51 ***	46.40 ***
	0.050	0.083	0.080	0.118	0.022	0.036	0.025	0.044	0.51	2.46
Event	0.226 ***	0.218 ***	0.324 ***	0.394 ***	0.003	-0.005	0.018 ***	0.088 ***	0.57 ***	3.49 ***
	0.009	0.009	0.010	0.010	0.004	0.004	0.005	0.005	0.02	0.07
Q*Event	-0.076 ***	-0.035 **	-0.066 ***	-0.088 ***	0.099 ***	0.140 ***	0.027 ***	0.006	0.27 ***	0.28
	0.017	0.017	0.019	0.019	0.007	0.007	0.009	0.009	0.05	0.17
T*Event	-0.019	-0.064 ***	0.058 **	0.076 ***	0.036 ***	-0.009	0.009	0.027 **	-0.48 ***	-0.64 ***
	0.021	0.021	0.023	0.023	0.008	0.009	0.011	0.011	0.06	0.19
TA*Event	0.064 ***	0.094 ***	-0.131 ***	-0.116 ***	-0.076 ***	-0.046 ***	-0.046 ***	-0.030 **	0.31 ***	0.79 ***
	0.019	0.020	0.024	0.024	0.008	0.009	0.011	0.012	0.05	0.15
VIX	-0.003 ***	-0.014 ***	-0.010 ***	-0.021 ***	-0.002 ***	-0.013 ***	-0.003 ***	-0.014 ***	-0.15 ***	-0.50 ***
	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.00	0.01
Nobs	39,029	39,029	36,243	36,243	39,029	39,029	36,243	36,243	39,029	36,243
R2 within	0.0278	0.0278	0.0473	0.0685	0.0237	0.0361	0.0028	0.0274	0.0790	0.1464
Wald Chi2(8)	1,096.7	1,095.0	1,810.2	2,664.5	975.5	1,489.2	107.4	1,035.3	3,175.5	5,704.6

This table reports the results from difference-in-difference collapsed panel regressions that test for changes in average quote quality and trading activity between the pre- and the post-pilot periods for stocks with a pre-event quoted spread in quartile one (Q1) and stocks with a pre-event quoted spread in quartile four (Q4). We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \qquad (2)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock *i* on day *t*, *Q*, *T* and *TA* are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares while Average Trade Size is based on continuous trading only and is measured in shares. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.4.9. The Term Structure of Liquidity Provision and Price Impacts with Q1 and Q4

II.Tick-constrained (Q1)	Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Realized Spreads								
30 second horizon	0.0039	0.0032	0.0039	0.0027	0.0038	0.0029	0.0040	0.0028
5 minute horizon	0.0042	0.0055	0.0044	0.0042	0.0040	0.0047	0.0042	0.0050
B. Price Impact								
30 second horizon	0.0038	0.0114	0.0037	0.0084	0.0034	0.0074	0.0038	0.0107
5 minute horizon	0.0032	0.0113	0.0028	0.0110	0.0029	0.0103	0.0034	0.0170
Nobs	9,473		3,354		2,925		4,017	

II.Unconstrained (Q4)	Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Realized Spreads								
30 second horizon	0.0163	0.0191	0.0164	0.0176	0.0162	0.0195	0.0153	0.0170
5 minute horizon	0.0203	0.0268	0.0203	0.0266	0.0205	0.0272	0.0192	0.0246
B. Price Impact								
30 second horizon	0.0465	0.0654	0.0468	0.0593	0.0513	0.0794	0.0489	0.0664
5 minute horizon	0.0389	0.0708	0.0393	0.0649	0.0430	0.0845	0.0412	0.0722
Nobs	8,567		3,259		3,290		3,248	

This table summarizes descriptive statistics on the term structure of liquidity provision and price discovery for the U.S. tick size pilot sample based on data from the period August 1 – September 23, 2016. Panel I reports the results for stocks that have an average pre-event quoted spread in quartile one (Q1) and Panel II reports the results for stocks that have an average pre-event quoted spread in quartile four (Q4). Control stocks are those that will continue being quoted and traded in decimals, G1 stocks will be subject to the quote rule, G2 stocks to the quote and the trade rules, and G3 stocks to the quote, trade, and trade-at rules. Data was drawn from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons.

Table IA.4.11. Changes in the Term Structure of Liquidity Provision and Price Impacts for Tick-Constrained and Unconstrained Stocks: Panel Regressions (Rules) with Q1 and Q4

A. Realized Spread	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	Q1	Q4	Q1	Q4	Q1	Q4	Q1	Q4	Q1	Q4	Q1	Q4
Intercept	0.0005	0.0412 ***	0.0002	0.0374 ***	0.0003	0.0334 ***	0.0004	0.0308 ***	0.0005	0.0293 ***	0.0005	0.0282 ***
	0.0005	0.0033	0.0005	0.0032	0.0005	0.0033	0.0005	0.0032	0.0005	0.0032	0.0005	0.0032
Event	0.0007 ***	0.0019 **	0.0008 ***	0.0017 *	0.0007 ***	0.0006	0.0007 ***	0.0004	0.0008 ***	-0.0001	0.0007 ***	0.0002
	0.0002	0.0009	0.0002	0.0009	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010
Q*Event	0.0123 ***	0.0006	0.0119 ***	0.0007	0.0114 ***	0.0015	0.0111 ***	0.0020	0.0109 ***	0.0028	0.0107 ***	0.0020
	0.0003	0.0017	0.0003	0.0017	0.0004	0.0018	0.0004	0.0018	0.0004	0.0019	0.0004	0.0019
T*Event	0.0011 ***	0.0018	0.0010 **	0.0019	0.0009 *	0.0016	0.0010 ***	0.0011	0.0010 *	0.0003	0.0010 *	0.0007
	0.0004	0.0023	0.0005	0.0023	0.0005	0.0024	0.0005	0.0024	0.0005	0.0025	0.0005	0.0025
TA*Event	-0.0039 ***	-0.0046 *	-0.0037 ***	-0.0048 *	-0.0035 ***	-0.0055 **	-0.0035 ***	-0.0059 **	-0.0035 ***	-0.0053 **	-0.0034 ***	-0.0053 **
	0.0004	0.0024	0.0005	0.0025	0.0005	0.0025	0.0006	0.0026	0.0006	0.0026	0.0006	0.0027
VIX	0.0002 ***	0.0006 ***	0.0002 ***	0.0007 ***	0.0002 ***	0.0008 ***	0.0002 ***	0.0009 ***	0.0002 ***	0.0010 ***	0.0002 ***	0.0010 ***
	0.0000	0.0001	0.0000	0.0001	0.0000	0.0002	0.0000	0.0002	0.0000	0.0002	0.0000	0.0002
Nobs	39,029	36,242	39,029	36,242	39,029	36,242	39,029	36,242	39,029	36,242	39,029	36,242
R2 within	0.1246	0.0012	0.1060	0.0012	0.0851	0.0013	0.0770	0.0014	0.0732	0.0014	0.0695	0.0014
Wald Chi2 (8)	5,782.8	37.4	4,657.1	38.0	3,797.0	39.2	3,328.1	45.8	3,008.1	47.4	2,788.4	47.6

B. Price Impact	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	Q1	Q4	Q1	Q4	Q1	Q4	Q1	Q4	Q1	Q4	Q1	Q4
Intercept	0.0043 ***	0.0191 ***	0.0044 ***	0.0210 ***	0.0044 ***	0.0230 ***	0.0044 ***	0.0243 ***	0.0043 ***	0.0250 ***	0.0043 ***	0.0255 ***
	0.0001	0.0010	0.0002	0.0010	0.0002	0.0011	0.0002	0.0011	0.0002	0.0012	0.0002	0.0012
Event	0.0003 ***	0.0049 ***	0.0002 ***	0.0050 ***	0.0003 ***	0.0055 ***	0.0003 ***	0.0057 ***	0.0002 ***	0.0059 ***	0.0003 ***	0.0058 ***
	0.0000	0.0003	0.0001	0.0003	0.0001	0.0004	0.0001	0.0004	0.0001	0.0004	0.0001	0.0005
Q*Event	0.0062 ***	0.0022 ***	0.0065 ***	0.0021 ***	0.0067 ***	0.0017 **	0.0068 ***	0.0015 **	0.0070 ***	0.0011	0.0070 ***	0.0015 *
	0.0001	0.0006	0.0001	0.0006	0.0001	0.0007	0.0002	0.0007	0.0002	0.0008	0.0002	0.0008
T*Event	0.0004 **	0.0007	0.0004 **	0.0006	0.0005 ***	0.0008	0.0004 **	0.0010	0.0004 **	0.0014	0.0004 **	0.0012
	0.0002	0.0007	0.0002	0.0008	0.0002	0.0009	0.0002	0.0010	0.0002	0.0010	0.0002	0.0010
TA*Event	0.0000	0.0020 ***	-0.0002	0.0021 **	-0.0002	0.0025 ***	-0.0003	0.0027 ***	-0.0003	0.0024 **	-0.0003	0.0024 **
	0.0001	0.0008	0.0002	0.0008	0.0002	0.0009	0.0002	0.0010	0.0002	0.0011	0.0002	0.0011
VIX	0.0000 ***	-0.0002 ***	0.0000 ***	-0.0002 ***	0.0000	-0.0002 ***	0.0000	-0.0003 ***	0.0000	-0.0003 ***	0.0000	-0.0003 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001
Nobs	39,029	36,242	39,029	36,242	39,029	36,242	39,029	36,242	39,029	36,242	39,029	36,242
R2 within	0.2953	0.0283	0.2725	0.0237	0.2498	0.0216	0.2236	0.0199	0.2050	0.0185	0.1855	0.0170
Wald Chi2 (8)	13,803.1	1,001.7	12,733.6	842.7	10,532.5	758.3	9,264.2	689.1	8,493.9	637.5	7,774.9	580.9

This table reports the results from difference-in-difference panel regressions that test for changes in the term structure of liquidity provision and price impacts for pre-event quoted spreads in quartile one (Q1) and stocks with pre-event quoted spreads in quartile four (Q4). We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \qquad (2)$$

where $MQ_{i,t}$ is a market quality measure (realized spread, price impact) for stock i on day t, Q, T and TA are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons. The estimated coefficients for the rule dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.5.6. Descriptive Statistics: for Middle Category and Complement Set Stocks

I. Pre-event Quoted Spread 5-10 cents		Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Firm Characteristics									
Market Capitalization	('000 dollar)	802,827	805,261	818,347	847,244	736,124	725,821	780,137	796,258
Price	(dollar)	24.29	17.91	24.94	19.60	23.63	17.03	23.10	15.88
Nfirms		260		80		84		73	
B. Quote Condition									
Quoted Spread	(dollar)	0.0702	0.0262	0.0696	0.0257	0.0675	0.0243	0.0700	0.0255
Effective Spread	(dollar)	0.0359	0.0275	0.0348	0.0271	0.0353	0.0268	0.0356	0.0269
Depth	(100 shares)	6.13	7.08	6.01	7.95	5.67	6.70	6.39	21.85
Volatility	(midquote)	0.0322	0.0273	0.0307	0.0234	0.0310	0.0284	0.0290	0.0184
C. Trading Activity									
Volume	(shares)	149,894	249,393	142,257	235,885	162,627	231,065	137,557	206,791
Average Trade Size	(shares)	130.33	110.15	125.43	77.08	120.08	69.72	130.96	216.70
Nobs		9,926		3,076		3,227		2,755	

II. Pre-event Quoted Spread > 5 cents		Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Firm Characteristics									
Market Capitalization	('000 dollar)	757,649	765,295	757,649	765,295	713,260	715,785	694,861	693,329
Price	(dollar)	32.78	28.14	32.78	28.14	31.09	25.87	30.33	24.37
Nfirms		520		178		184		170	
B. Quote Condition									
Quoted Spread	(dollar)	0.1441	0.1345	0.1441	0.1345	0.1426	0.1398	0.1458	0.1317
Effective Spread	(dollar)	0.0608	0.0579	0.0608	0.0579	0.0635	0.0713	0.0649	0.1401
Depth	(100 shares)	5.70	7.29	5.70	7.29	5.62	10.38	6.01	15.52
Volatility	(midquote)	0.0317	0.0247	0.0317	0.0247	0.0321	0.0308	0.0320	0.0250
C. Trading Activity									
Volume	(shares)	105,943	196,164	105,943	196,164	121,329	213,594	106,416	255,165
Average Trade Size	(shares)	116.58	77.69	116.58	77.69	112.04	74.52	118.68	159.58
Nobs		6,655		6,655		6,826		6,294	

This table summarizes descriptive statistics for the U.S. tick size pilot sample based on data from the period August 1 – September 23, 2016. Panel I reports the results for stocks that have an average pre-event quoted spread between 5 and 10 cents and Panel II reports the results for stocks that have an average pre-event quoted spread above 5 cents during the pre-pilot period. Control stocks are those that will continue being quoted and traded in decimals, G1 stocks will be subject to the quote rule, G2 stocks to the quote and the trade rules, and G3 stocks to the quote, trade, and trade-at rules. Data was drawn from TRTH and CRSP data bases. Market capitalization as of June 20, 2016, is measured in $1,000 dollars and Price is the stock price in dollars, both variables from CRSP. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars, Depth denotes the time-weighted NBBO depth, and is reported in round lots of 100 shares and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares while Average Trade Size is measured during continuous trading only.

Table IA.5.7. Changes in Market Quality for Middle Category and Complement Set Stocks: Panel Regressions (Rules)

	Quoted Spread		Effective Spread		log Depth				Volatility	
A. Quote Quality	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents		> 5 cents		5-10 cents	> 5 cents
	(dollar)	(dollar)	(dollar)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	Midquote	Midquote
Intercept	0.0707 ***	0.1501 ***	0.0318 ***	0.0567 ***	1.702 ***	4.666 ***	1.654 ***	4.859 ***	0.0259 ***	0.0271 ***
	0.0014	0.0067	0.0011	0.0023	0.029	0.036	0.021	0.028	0.0012	0.0009
Event	0.0112 ***	0.0301 ***	0.0035 ***	0.0077 ***	0.101 ***	0.110 ***	0.100 ***	0.138 ***	0.0050 ***	0.0059 ***
	0.0004	0.0009	0.0004	0.0005	0.006	0.006	0.004	0.004	0.0003	0.0003
Q*Event	0.0202 ***	-0.0026	0.0185 ***	0.0122 ***	0.627 ***	0.658 ***	0.455 ***	0.459 ***	-0.0014	-0.0023 ***
	0.0008	0.0017	0.0009	0.0010	0.013	0.013	0.009	0.009	0.0006	0.0006
T*Event	0.0025 ***	0.0006	0.0026 **	0.0022	0.032 **	0.034 **	-0.001	0.008	0.0003	-0.0010
	0.0009	0.0020	0.0011	0.0014	0.016	0.015	0.011	0.011	0.0008	0.0006
TA*Event	-0.0011	0.0016	-0.0025 **	-0.0024	-0.097 ***	-0.076 ***	-0.053 ***	-0.042 ***	0.0034 ***	0.0033 ***
	0.0010	0.0021	0.0012	0.0022	0.016	0.016	0.011	0.011	0.0007	0.0006
VIX	0.0000	-0.0002 *	0.0003 ***	0.0004 ***	-0.008 ***	-0.019 ***	-0.008 ***	-0.019 ***	0.0005 ***	0.0004 ***
	0.0001	0.0001	0.0001	0.0001	0.001	0.001	0.001	0.001	0.0001	0.0000
Nobs	37,611	77,373	37,611	77,373	37,611	37,611	77,373	77,373	37,611	77,373
R2 within	0.1502	0.0303	0.0679	0.0153	0.2630	0.2988	0.1652	0.2032	0.0172	0.0133
Wald Chi2(8)	7,852.6	2,342.9	2,414.8	1,527.2	12,148.1	14,664.8	13,933.3	18,243.9	650.7	1,019.5

	log Volume				log Average Trade Size				Price	
B. Trading Activity	5-10 cents		> 5 cents		5-10 cents		> 5 cents		5-10 cents	> 5 cents
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)	(dollar)
Intercept	11.276 ***	14.236 ***	10.906 ***	14.107 ***	4.769 ***	7.728 ***	4.676 ***	7.876 ***	28.46 ***	36.44 ***
	0.067	0.116	0.054	0.082	0.024	0.042	0.018	0.031	1.19	1.35
Event	0.328 ***	0.338 ***	0.330 ***	0.368 ***	0.032 ***	0.042 ***	0.027 ***	0.065 ***	1.34 ***	2.30 ***
	0.010	0.010	0.007	0.007	0.004	0.004	0.003	0.003	0.04	0.04
Q*Event	-0.056 ***	-0.020	-0.048 ***	-0.041 ***	0.063 ***	0.099 ***	0.045 ***	0.052 ***	0.79 ***	0.56 ***
	0.020	0.020	0.013	0.014	0.008	0.008	0.006	0.006	0.08	0.09
T*Event	-0.039	-0.038	-0.005	0.005	-0.019 *	-0.018 *	-0.005	0.005	-0.30 ***	-0.48 ***
	0.024	0.024	0.016	0.016	0.010	0.010	0.007	0.008	0.10	0.10
TA*Event	-0.064 ***	-0.042 *	-0.086 ***	-0.074 ***	-0.050 ***	-0.029 **	-0.045 ***	-0.034 ***	0.12	0.45 ***
	0.024	0.024	0.016	0.017	0.011	0.011	0.008	0.008	0.11	0.09
VIX	-0.006 ***	-0.016 ***	-0.008 ***	-0.019 ***	-0.001 **	-0.012 ***	-0.002 ***	-0.012 ***	-0.32 ***	-0.40 ***
	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.01	0.01
Nobs	37,611	37,611	77,373	77,373	37,611	37,611	77,373	77,373	37,611	77,373
R2 within	0.0440	0.0508	0.0469	0.0601	0.0090	0.0264	0.0056	0.0257	0.1165	0.1205
Wald Chi2(8)	1,698.5	1,983.6	3,790.5	4,912.4	358.2	1,061.5	450.4	2,055.4	4,603.7	9,438.2

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for stocks with pre-event quoted spreads between 5 and 10 cents and stocks with pre-event quoted spreads larger than 5 cents. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (2)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock *i* on day *t*, *Q*, *T* and *TA* are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.5.9. The Term Structure of Liquidity Provision and Price Impacts for Middle Category and Complement Set Stocks

II.Pre-event Quoted Spread 5-10 cents	Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Realized Spreads								
30 second horizon	0.0084	0.0074	0.0084	0.0064	0.0083	0.0071	0.0079	0.0077
5 minute horizon	0.0097	0.0113	0.0090	0.0094	0.0095	0.0107	0.0092	0.0112
B. Price Impact								
30 second horizon	0.0142	0.0227	0.0134	0.0237	0.0136	0.0209	0.0150	0.0231
5 minute horizon	0.0117	0.0289	0.0121	0.0278	0.0114	0.0264	0.0123	0.0272
Nobs	9,926		3,076		3,227		2,755	

II.Pre-event Quoted Spread > 5 cents	Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Realized Spreads								
30 second horizon	0.0120	0.0144	0.0123	0.0138	0.0122	0.0151	0.0119	0.0138
5 minute horizon	0.0145	0.0205	0.0146	0.0207	0.0149	0.0212	0.0146	0.0200
B. Price Impact								
30 second horizon	0.0289	0.0493	0.0303	0.0479	0.0322	0.0601	0.0328	0.0532
5 minute horizon	0.0241	0.0535	0.0258	0.0515	0.0270	0.0637	0.0275	0.0571
Nobs	19,365		6,655		6,826		6,294	

This table summarizes descriptive statistics on the term structure of liquidity provision and price discovery for the U.S. tick size pilot sample based on data from the period August 1 – September 23, 2016. Panel I reports the results for stocks that have an average pre-event quoted spread between 5 and 10 cents and Panel II reports the results for stocks that have an average pre-event quoted spread above 5 cents during the pre-pilot period. Control stocks are those that will continue being quoted and traded in decimals, G1 stocks will be subject to the quote rule, G2 stocks to the quote and the trade rules, and G3 stocks to the quote, trade, and trade-at rules. Data was drawn from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons.

Table IA.5.11. Changes in the Term Structure of Liquidity Provision and Price Impacts for Middle Category and Complement Set Stocks: Panel Regressions (Rules)

A. Realized Spread	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents	> 5 cents
Intercept	0.0093 ***	0.0241 ***	0.0082 ***	0.0218 ***	0.0075 ***	0.0195 ***	0.0073 ***	0.0183 ***	0.0071 ***	0.0174 ***	0.0073 ***	0.0169 ***
	0.0010	0.0018	0.0010	0.0017	0.0010	0.0017	0.0010	0.0017	0.0011	0.0017	0.0011	0.0017
Event	0.0007 *	0.0012 ***	0.0008 **	0.0012 ***	0.0005	0.0006	0.0002	0.0003	0.0002	0.0001	0.0003	0.0002
	0.0003	0.0004	0.0004	0.0005	0.0004	0.0005	0.0004	0.0005	0.0004	0.0005	0.0004	0.0005
Q*Event	0.0090 ***	0.0046 ***	0.0086 ***	0.0044 ***	0.0085 ***	0.0048 ***	0.0083 ***	0.0050 ***	0.0079 ***	0.0051 ***	0.0078 ***	0.0047 ***
	0.0007	0.0009	0.0008	0.0009	0.0008	0.0009	0.0008	0.0010	0.0009	0.0010	0.0009	0.0010
T*Event	0.0021 **	0.0022 *	0.0020 **	0.0022 *	0.0019 *	0.0020	0.0022 **	0.0018	0.0025 **	0.0016	0.0025 **	0.0018
	0.0010	0.0012	0.0010	0.0012	0.0011	0.0013	0.0011	0.0013	0.0011	0.0013	0.0012	0.0014
TA*Event	-0.0033 ***	-0.0041 ***	-0.0028 **	-0.0039 ***	-0.0029 **	-0.0043 ***	-0.0027 **	-0.0044 ***	-0.0025 **	-0.0040 ***	-0.0024 *	-0.0040 ***
	0.0011	0.0013	0.0011	0.0013	0.0012	0.0014	0.0012	0.0014	0.0012	0.0014	0.0013	0.0015
VIX	0.0004 ***	0.0005 ***	0.0003 ***	0.0005 ***	0.0003 ***	0.0006 ***	0.0003 ***	0.0006 ***	0.0004 ***	0.0006 ***	0.0003 ***	0.0007 ***
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Nobs	37,611	77,372	37,611	77,372	37,611	77,372	37,611	77,372	37,611	77,372	37,611	77,372
R2 within	0.0202	0.0034	0.0181	0.0032	0.0146	0.0027	0.0130	0.0026	0.0117	0.0024	0.0109	0.0023
Wald Chi2 (8)	662.2	222.0	596.6	208.2	489.0	177.4	435.3	172.8	398.0	164.5	377.4	159.1

B. Price Impact	30 second horizon		1 minute horizon		2 minute horizon		3 minute horizon		4 minute horizon		5 minute horizon	
	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents	> 5 cents	5-10 cents	> 5 cents
Intercept	0.0094 ***	0.0139 ***	0.0100 ***	0.0151 ***	0.0103 ***	0.0162 ***	0.0104 ***	0.0168 ***	0.0106 ***	0.0173 ***	0.0105 ***	0.0174 ***
	0.0003	0.0005	0.0003	0.0006	0.0004	0.0006	0.0004	0.0006	0.0004	0.0007	0.0004	0.0007
Event	0.0013 ***	0.0029 ***	0.0012 ***	0.0029 ***	0.0014 ***	0.0032 ***	0.0015 ***	0.0033 ***	0.0015 ***	0.0035 ***	0.0015 ***	0.0034 ***
	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Q*Event	0.0044 ***	0.0034 ***	0.0046 ***	0.0035 ***	0.0047 ***	0.0032 ***	0.0048 ***	0.0032 ***	0.0050 ***	0.0031 ***	0.0050 ***	0.0033 ***
	0.0002	0.0003	0.0002	0.0003	0.0003	0.0004	0.0003	0.0004	0.0003	0.0004	0.0003	0.0004
T*Event	0.0005 *	0.0006 *	0.0005 *	0.0006	0.0006	0.0007	0.0005	0.0008	0.0003	0.0009 *	0.0003	0.0009
	0.0003	0.0004	0.0003	0.0004	0.0004	0.0005	0.0004	0.0005	0.0004	0.0005	0.0004	0.0005
TA*Event	-0.0003	0.0008 *	-0.0006	0.0007	-0.0005	0.0009 *	-0.0006	0.0010 *	-0.0008 *	0.0007	-0.0008 *	0.0007
	0.0003	0.0004	0.0004	0.0005	0.0004	0.0005	0.0004	0.0005	0.0005	0.0006	0.0005	0.0006
VIX	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 ***	-0.0001 **	-0.0001 ***	-0.0001 **	-0.0002 ***	-0.0001 ***	-0.0002 ***	-0.0001 ***	-0.0002 ***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nobs	37,611	77,372	37,611	77,372	37,611	77,372	37,611	77,372	37,611	77,372	37,611	77,372
R2 within	0.0658	0.0304	0.0549	0.0251	0.0463	0.0223	0.0419	0.0203	0.0376	0.0188	0.0338	0.0172
Wald Chi2 (8)	2,483.2	2,220.9	2,105.4	1,850.0	1,782.5	1,611.9	1,598.4	1,469.6	1,438.2	1,357.1	1,297.2	1,238.1

This table reports the results from difference-in-difference panel regressions that test for changes in the term structure of liquidity provision and price impacts for pre-event quoted spread between 5 and 10 cents and stocks with a pre-event quoted spread larger than 5 cents. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \qquad (2)$$

where $MQ_{i,t}$ is a market quality measure (realized spread, price impact) for stock i on day t, Q, T and TA are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Realized Spreads and Price Impacts are share-weighted and measured in dollars. We compute each measure at the 30 second, and the one, two, three, four, and five-minute horizons. The estimated coefficients for the rule dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.6 List of Excluded Symbols by Reason*

Reason	Nasdaq	NYSE
Moved group (P)	OPXA	
	APTS	
Change of listing (T,U)	FXCM	DNVO
	IMPV	FCFS
Change of symbol (C,S)	HOPE	AMN
	CCN	SLD
	XBKS	LFGR
	TIVO	
	CNXN	
	AXAR	
	FUSB	
	EB	
	TWNK	
	GECXU	
	GNMX	
Preferred stock		CRD A
		CRD B
		AGM A
		GEF B
		GTN A
		HEI A
		HVT A
		JW A
		JW B
		MOG A
		MOG B
		NYLD A

*List of symbols excluded due to low trading activity is available from the authors on request.

Table IA.7.1 Changes for Boundary Stocks Relative to Control Stocks

A. Quote Quality	Quoted Spread (dollar)	Effective Spread (dollar)	log Depth (shares)	Volatility (dollar)	Volatility Midquote
Intercept	0.0839 ***	0.0348 ***	1.882 ***	4.746 ***	
	0.0011	0.0008	0.008	0.008	
Event	0.0179 ***	0.0054 ***	0.055 ***	0.083 ***	
	0.0004	0.0003	0.003	0.003	
BP*Event	-0.0182 ***	-0.0067 ***	-0.104 ***	-0.180 ***	
	0.0008	0.0006	0.028	0.028	
BS*Event	-0.0129 ***	-0.0055 ***	-0.007	-0.026 *	
	0.0014	0.0005	0.013	0.014	
BV*Event	-0.0137 ***	-0.0039 ***	-0.150 ***	-0.138 ***	
	0.0006	0.0003	0.021	0.020	
VIX	-0.0004 ***	0.0001 **	-0.006 ***	-0.017 ***	
	0.0001	0.0001	0.001	0.001	
Nobs	82,387	82,386	82,387	82,387	
R2 within	0.0216	0.0047	0.0051	0.0172	

B. Trading Activity	log Volume (shares)	log Volume (dollar)	log Average Trade Size (shares)	log Average Trade Size (dollar)	Price (dollar)
Intercept	11.689 ***	14.550 ***	4.820 ***	7.528 ***	27.20 ***
	0.013	0.013	0.006	0.006	0.06
Event	0.293 ***	0.321 ***	0.013 ***	0.041 ***	1.58 ***
	0.005	0.005	0.002	0.002	0.02
BP*Event	-0.263 ***	-0.339 ***	0.077 ***	0.051 **	-1.18 ***
	0.052	0.055	0.021	0.026	0.04
BS*Event	0.067 ***	0.048 **	0.030 ***	0.113 ***	-0.77 *
	0.023	0.023	0.008	0.013	0.40
BV*Event	-0.266 ***	-0.255 ***	-0.035 ***	0.028 **	-0.36 ***
	0.026	0.027	0.008	0.013	0.10
VIX	-0.006 ***	-0.017 ***	-0.002 ***	-0.012 ***	-0.29 ***
	0.001	0.001	0.000	0.000	0.00
Nobs	82,386	82,386	82,386	82,386	82,386
R2 within	0.0464	0.0527	0.0014	0.0134	0.0822

C. Five Minute	Realized Spread (dollar)	Price Impact (dollar)
Intercept	0.0106 ***	0.0104 ***
	0.0008	0.0003
Event	0.0009 ***	0.0020 ***
	0.0003	0.0001
BP*Event	-0.0017 **	-0.0022 ***
	0.0009	0.0004
BS*Event	-0.0005	-0.0022 ***
	0.0013	0.0006
BV*Event	0.0023 ***	-0.0028 ***
	0.0007	0.0003
VIX	0.0002 ***	-0.0001 ***
	0.0001	0.0000
Nobs	82,385	82,385
R2 within	0.0005	0.0038

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for boundary stocks relative to the U.S. tick size pilot control stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot BP \cdot Event + \gamma_4 \cdot BS \cdot Event + \gamma_5 \cdot BV \cdot Event + \gamma_6 \cdot X_t + \mu_{i,t}, \quad (5)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity, five-minute realized spreads and price impacts) for stock i on day t, f_i are individual firm dummies, *Event* is a dummy that takes on a value of one for days in the post-period, *BP*, *BS*, and *BV* are boundary stock group dummies, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks and boundary stocks (BP, BS, and BV) continue being quoted and traded in decimals. BP stocks have stock prices between $1.50 and $2.00 but otherwise satisfy the pilot parameters, BS have market capitalization between $3bn and $6bn but otherwise satisfy the pilot parameters, and BV stocks have share volume between 1mn and 2mn but otherwise satisfy the pilot

parameters. Measures are calculated based on data from TRTH and TAQ. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.7.2 Changes for Boundary Stocks relative to Control Stocks Close to Boundary

	Quoted Spread	Effective Spread	log Depth	Volatility	
A. Quote Quality					
	(dollar)	(dollar)	(shares)	(dollar)	Midquote
Intercept	0.0464 ***	0.0211 ***	2.075 ***	4.708 ***	
	0.0011	0.0011	0.020	0.019	
Event	0.0078 ***	0.0028 ***	0.022 ***	-0.041 ***	
	0.0005	0.0006	0.008	0.008	
BP*Event	-0.0089 ***	-0.0042 ***	-0.074 ***	-0.063 **	
	0.0008	0.0007	0.029	0.029	
BS*Event	-0.0032 **	-0.0030 ***	0.024	0.094 ***	
	0.0014	0.0007	0.015	0.016	
BV*Event	-0.0039 ***	-0.0013 **	-0.118 ***	-0.018	
	0.0006	0.0006	0.022	0.022	
VIX	0.0001 ***	0.0002 ***	-0.004 ***	-0.013 ***	
	0.0001	0.0001	0.001	0.001	
Nobs	16,610	16,609	16,610	16,610	
R2 within	0.0195	0.0036	0.0032	0.0107	

	log Volume		log Average Trade Size		Price
B. Trading Activity					
	(shares)	(dollar)	(shares)	(dollar)	(dollar)
Intercept	12.601 ***	15.233 ***	5.058 ***	6.932 ***	32.806 ***
	0.033	0.033	0.013	0.016	0.187
Event	0.219 ***	0.156 ***	0.026 ***	-0.040 ***	0.379 ***
	0.013	0.013	0.005	0.006	0.080
BP*Event	-0.189 ***	-0.177 ***	0.065 ***	0.125 ***	0.013
	0.054	0.057	0.021	0.026	0.085
BS*Event	0.142 ***	0.213 ***	0.018 *	0.190 ***	0.425
	0.026	0.026	0.009	0.014	0.406
BV*Event	-0.192 ***	-0.091 ***	-0.047 ***	0.105 ***	0.837 ***
	0.029	0.030	0.009	0.014	0.121
VIX	-0.006	-0.015 ***	-0.002 **	-0.008 ***	-0.286 ***
	0.002	0.002	0.001	0.001	0.014
Nobs	16,609	16,609	16,609	16,609	16,609
R2 within	0.0210	0.0150	0.0051	0.0135	0.0267

	Realized Spread	Price Impact
C. Five Minute		
	(dollar)	(dollar)
Intercept	0.007 ***	0.006 ***
	0.001	0.000
Event	0.002 ***	0.000
	0.001	0.000
BP*Event	-0.002 **	-0.001 *
	0.001	0.000
BS*Event	-0.001	-0.001
	0.001	0.001
BV*Event	0.001 *	-0.001 ***
	0.001	0.000
VIX	0.000	0.000 ***
	0.000	0.000
Nobs	16,609	16,609
R2 within	0.0017	0.0008

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for boundary stocks relative to the U.S. tick size pilot control stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot BP \cdot Event + \gamma_4 \cdot BS \cdot Event + \gamma_5 \cdot BV \cdot Event + \gamma_6 \cdot X_t + \mu_{i,t}, \quad (5)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity, five-minute realized spreads and price impacts) for stock i on day t, f_i are individual firm dummies, *Event* is a dummy that takes on a value of one for days in the post-period, *BP*, *BS*, and *BV* are boundary stock group dummies, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks and boundary stocks (BP, BS, and BV) continue being quoted and traded in decimals. This table selects controls stocks closest to the cutoffs for price (CP), market capitalization (CS), and trading volume (CV). BP stocks have stock prices between $1.50 and $2.00 but otherwise satisfy the pilot parameters, BS have market capitalization between $3bn and $6bn but otherwise satisfy the pilot parameters, and BV stocks have share volume between 1mn and 2mn but otherwise satisfy the pilot parameters. Measures are calculated based on data from TRTH and TAQ. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.7.3 Changes for Boundary Stocks relative to Control Stocks and Control Stocks Close to Boundary, and for Holdout Stocks relative to Control Stocks and Propensity Matched Control Stocks

	Quote Quality				Trading Activity			
A. Boundary Stocks Relative to Controls	Quoted Spread (%)	Effective Spread (%)	Depth (shares)	Depth (dollar)	Volume (shares)	Volume (dollar)	Average Trade Size (shares)	Average Trade Size (dollar)
Intercept	0.0047 ***	0.0022 ***	12.58 ***	256.69 ***	256,662 ***	6,404,438 ***	144.80 ***	2,536.71 ***
	0.0001	0.0001	0.94	45.19	12,084	221,761	2.45	17.41
Event	0.0006 ***	0.0002 ***	1.64 ***	26.44 ***	70,580 ***	1,498,715 ***	2.91 **	63.40 ***
	0.0000	0.0000	0.23	3.64	3,650	69,963	1.36	8.71
B*Event	0.0002	0.0000	9.02 *	636.93 **	112,546 ***	7,040,889 ***	15.92 ***	-4.17
	0.0002	0.0001	5.00	281.56	36,410	898,340	3.13	10.37
VIX	0.0001 ***	0.0000 **	-0.29 ***	-10.33 ***	953	9,007	-0.27 *	-24.37 ***
	0.0000	0.0000	0.07	3.44	877	16,064	0.16	1.20
Nobs	82,387	82,386	82,387	82,387	82,387	82,387	82,386	82,386
R2 within	0.0068	0.0021	0.0010	0.0012	0.0049	0.0112	0.0002	0.0029

	Quote Quality				Trading Activity			
B. Boundary Stocks Relative to Controls Close to Boundary	Quoted Spread (%)	Effective Spread (%)	Depth (shares)	Depth (dollar)	Volume (shares)	Volume (dollar)	Average Trade Size (shares)	Average Trade Size (dollar)
Intercept	0.0055 ***	0.0029 ***	22.33 ***	635.49 ***	546,436 ***	13,997,976 ***	185.69 ***	2,142.85 ***
	0.0003	0.0002	4.01	224.26	50,035	925,770	6.76	29.19
Event	0.0007 ***	0.0003 ***	1.25 ***	24.85 *	99,159 ***	2,393,064 ***	11.25 ***	-88.32 ***
	0.0001	0.0001	0.36	13.44	16,408	351,397	1.86	14.85
B*Event	0.0001	-0.0002	9.85 *	666.50 **	79,747 **	5,975,215 ***	7.32 **	137.38 ***
	0.0002	0.0002	5.06	284.67	39,437	960,386	3.43	15.91
VIX	0.0001	0.0000 ***	-0.71 **	-37.64 **	5,073	176,218 ***	-0.02	-14.45 ***
	0.0000	0.0000	0.31	17.08	3,601	67,119	0.50	2.12
Nobs	16,610	16,609	16,610	16,610	16,610	16,610	16,609	16,609
R2 within	0.005	0.001	0.001	0.001	0.004	0.013	0.005	0.007

	Quote Quality				Trading Activity			
C. Holdout Stocks Relative to Controls	Quoted Spread (%)	Effective Spread (%)	Depth (shares)	Depth (dollar)	Volume (shares)	Volume (dollar)	Average Trade Size (shares)	Average Trade Size (dollar)
Intercept	0.0050 ***	0.0023 ***	10.44 ***	160.86 ***	240,705 ***	5,954,934 ***	139.70 ***	2,563.84 ***
	0.0001	0.0001	0.51	5.31	9,719	190,314	5.08	18.59
Event	0.0006 ***	0.0002 ***	1.54 ***	20.73 ***	71,220 ***	1,527,617 ***	2.74 ***	63.37 ***
	0.0000	0.0000	0.23	2.38	3,628	69,656	1.39	8.72
H*Event	-0.0032 ***	-0.0009 ***	-0.45	-9.89 **	40,412 *	-113,756	5.30	3.71
	0.0005	0.0003	0.31	4.51	22,148	412,277	20.38	32.30
VIX	0.0001 ***	0.0000 ***	-0.16 ***	-3.25 ***	161	-26,811 *	-0.06	-24.35 ***
	0.0000	0.0000	0.04	0.40	714	13,750	0.37	1.31
Nobs	81,328	81,206	81,328	81,328	81,328	81,328	81,206	81,181
R2 within	0.0060	0.0015	0.0009	0.0017	0.0055	0.0059	0.0000	0.0019

	Quote Quality				Trading Activity			
D. Holdout Stocks Relative to Propensity Score Matched Controls	Quoted Spread (%)	Effective Spread (%)	Depth (shares)	Depth (dollar)	Volume (shares)	Volume (dollar)	Average Trade Size (shares)	Average Trade Size (dollar)
Intercept	0.0074 ***	0.0029 ***	12.38 ***	142.85 ***	558,796 ***	9,743,430 ***	155.84 ***	1,156.23 ***
	0.0006	0.0004	0.52	6.07	38,856	598,190	35.70	51.57
Event	0.0004 ***	0.0003 ***	1.16 ***	7.68 ***	184,610 ***	2,773,873 ***	4.62 *	43.45 **
	0.0001	0.0001	0.35	2.97	30,086	377,844	2.74	17.96
H*Event	-0.0031 ***	-0.0009 ***	-0.04	3.00	-66,649 *	-1,231,918 **	2.06	10.15
	0.0005	0.0003	0.41	4.88	36,326	545,923	20.46	35.77
VIX	0.0000	0.0000	-0.21 ***	-3.06 ***	-7,993 ***	-191,820 ***	1.69	-6.87 *
	0.0000	0.0000	0.04	0.49	2,758	41,182	2.67	4.17
Nobs	10,345	10,223	10,345	10,345	10,345	10,345	10,223	10,198
R2 within	0.0052	0.0009	0.0033	0.0012	0.0070	0.0068	0.0001	0.0001

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for boundary stocks relative to the U.S. tick size pilot control stocks between the pre- and the post-pilot periods based on the following specification:

$$MQ_{i,t} = \gamma_0 + \gamma_1 \cdot f_i + \gamma_2 \cdot Event + \gamma_3 \cdot S \cdot Event + \gamma_4 \cdot X_t + \mu_{i,t}, \qquad (3)$$

where $MQ_{i,t}$ is a market quality measure (quote quality and trading activity) for stock i on day t, f_i are individual firm dummies, *Event* is a dummy that takes on a value of one for days in the post-period, S is the boundary stock (holdout stock) group dummy, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks, boundary stocks, and holdout stocks continue being quoted and traded in decimals. Boundary stocks consist of three groups of stocks: stocks with prices between $1.50 and $2.00 but otherwise satisfy the pilot parameters, stocks with market capitalization between $3bn and $6bn but otherwise satisfy the pilot parameters, and stocks with share volume between 1mn and 2mn but otherwise satisfy the pilot parameters. Holdout stocks are stocks that were eligible according to the price, size, and volume criteria on August 31, 2016, but were eliminated by the SEC in early September 2016. Measures are calculated based on data from TRTH and TAQ. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.8.1. Descriptive Statistics for Nasdaq-Listed and NYSE-Listed Stocks

I. Nasdaq-Listed Stocks		Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Firm Characteristics									
Market Capitalization	('000 dollar)	627,746	667,522	599,621	624,247	623,818	651,323	628,280	658,569
Price	(dollar)	20.93	20.26	20.93	19.76	21.48	20.63	21.52	21.37
Nfirms		693		230		225		232	
B. Quote Quality									
Quoted Spread	(dollar)	0.0917	0.1275	0.0964	0.1305	0.0990	0.1329	0.0956	0.1243
Effective Spread	(dollar)	0.0421	0.0577	0.0430	0.0564	0.0459	0.0695	0.0438	0.0582
Depth	(100 shares)	8.65	16.68	8.44	11.56	8.32	11.76	9.04	15.91
Volatility	(midquote)	0.0320	0.0024	0.0317	0.0239	0.0318	0.0285	0.0309	0.0244
C. Trading Activity									
Volume	(shares)	200,112	371,066	183,897	352,151	214,521	456,905	213,172	447,555
Average Trade Size	(shares)	135.58	295.39	133.23	89.29	130.55	131.83	136.59	145.75
Nobs		26,122		8,690		8,471		8,726	

II. NYSE-Listed Stocks		Control Stocks		G1 Stocks		G2 Stocks		G3 Stocks	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A. Firm Characteristics									
Market Capitalization	('000 dollar)	1,029,713	792,315	1,056,433	827,370	982,634	701,815	1,024,722	773,120
Price	(dollar)	25.85	21.41	28.97	27.73	27.21	22.31	23.61	17.55
Nfirms		320		111		111		107	
B. Quote Quality									
Quoted Spread	(dollar)	0.0645	0.0748	0.0715	0.0837	0.0718	0.0749	0.0606	0.0672
Effective Spread	(dollar)	0.0325	0.0368	0.0339	0.0356	0.0362	0.0449	0.0336	0.1594
Depth	(100 shares)	7.50	9.26	8.64	12.23	7.15	7.72	8.72	14.47
Volatility	(midquote)	0.0233	0.0161	0.0237	0.0172	0.0239	0.0172	0.0240	0.0161
C. Trading Activity									
Volume	(shares)	266,747	357,110	296,172	368,758	271,381	378,234	280,005	415,002
Average Trade Size	(shares)	129.58	156.78	125.59	66.14	124.27	82.30	136.75	78.83
Nobs		12,365		4,309		4,260		4,122	

This table summarizes descriptive statistics for the U.S. tick size pilot sample based on data from the period August 1 – September 23, 2016, for Nasdaq-listed stocks in Panel I and NYSE-listed stocks in Panel II. Control stocks are those that will continue being quoted and traded in decimals, G1 stocks will be subject to the quote rule, G2 stocks to the quote and the trade rules, and G3 stocks to the quote, trade, and trade-at rules. Data was drawn from TRTH and CRSP data bases. Market capitalization as of June 20, 2016, is measured in $1,000 dollars and Price is the stock price in dollars, both variables from CRSP. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars, Depth denotes the time-weighted NBBO depth, and is reported in round lots of 100 shares and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares while Average Trade Size is measured during continuous trading only.\

Table IA.8.2. Changes in Market Quality for Nasdaq-Listed and NYSE-Listed Stocks: Panel Regressions (Rules)

	Quoted Spread				log Depth				Volatility	
A. Quote Quality	Nasdaq		NYSE		Nasdaq		NYSE		Nasdaq	NYSE
	(dollar)	(%)	(dollar)	(%)	(shares)	(dollar)	(shares)	(dollar)	Midquote	Midquote
Intercept	0.1074 ***	0.0056 ***	0.0659 ***	0.0026 ***	1.930 ***	4.736 ***	1.797 ***	4.907 ***	0.0270 ***	0.0189 ***
	0.0062	0.0003	0.0040	0.0002	0.024	0.023	0.034	0.028	0.0007	0.0006
Event	0.0226 ***	0.0008 ***	0.0090 ***	0.0001 ***	0.070 ***	0.093 ***	0.026 ***	0.064 ***	0.0070 ***	0.0015 ***
	0.0007	0.0000	0.0004	0.0000	0.004	0.004	0.004	0.004	0.0002	0.0002
Q*Event	0.0124 ***	0.0022 ***	0.0203 ***	0.0023 ***	0.770 ***	0.774 ***	0.741 ***	0.779 ***	0.0011 **	0.0065 **
	0.0013	0.0001	0.0008	0.0001	0.009	0.008	0.010	0.010	0.0047	0.0004
T*Event	0.0043 **	-0.0002 *	-0.0029 ***	-0.0006 ***	-0.054 ***	-0.043 ***	0.089 ***	0.085 ***	-0.0004	-0.0003
	0.0017	0.0001	0.0009	0.0001	0.011	0.011	0.014	0.014	0.0006	0.0005
TA*Event	-0.0061 **	0.0003 **	0.0042 ***	0.0005 ***	0.041 ***	0.046 ***	0.091 ***	0.062 ***	0.0064 ***	0.0058 ***
	0.0017	0.0001	0.0009	0.0001	0.011	0.011	0.014	0.014	0.0005	0.0005
VIX	-0.0003 ***	0.0000 ***	0.0000	0.0000 ***	-0.009 ***	-0.019 ***	-0.004 ***	-0.017 ***	0.0004 ***	0.0003 ***
	0.0001	0.0000	0.0001	0.0000	0.001	0.001	0.001	0.001	0.0000	0.0000
Nobs	102,907	102,907	49,450	49,450	102,907	102,907	49,450	49,450	102,907	49,450
R2 within	0.0383	0.0491	0.1230	0.1543	0.2693	0.3004	0.3757	0.4163	0.0343	0.0676
Wald Chi2(8)	3,938.4	5,012.3	7,344.6	6,674.1	32,996.9	39,518.6	23,265.4	27,526.0	3,568.3	2,745.1

	log Volume				log Average Trade Size				Price	
B. Trading Activity	Nasdaq		NYSE		Nasdaq		NYSE		Nasdaq	NYSE
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)	(dollar)
Intercept	11.353 ***	14.157 ***	11.877 ***	14.985 ***	4.788 ***	7.592 ***	4.758 ***	7.865 ***	25.45 ***	30.75 ***
	0.052	0.067	0.060	0.080	0.016	0.026	0.019	0.036	0.86	1.25
Event	0.296 ***	0.320 ***	0.289 ***	0.325 ***	0.021 ***	0.046 ***	-0.005 **	0.031 ***	1.63 ***	1.47 ***
	0.006	0.006	0.007	0.007	0.003	0.003	0.003	0.003	0.03	0.04
Q*Event	-0.026 **	-0.021 *	-0.102 ***	-0.061 ***	0.077 ***	0.082 ***	0.063 ***	0.104 ***	0.24 ***	0.83 ***
	0.012	0.012	0.014	0.014	0.005	0.005	0.006	0.006	0.05	0.11
T*Event	-0.056 ***	-0.044 ***	0.061 ***	0.054 ***	-0.020 ***	-0.008	0.034 ***	0.027 ***	0.14 **	0.32 ***
	0.015	0.015	0.017	0.017	0.007	0.007	0.007	0.008	0.07	0.07
TA*Event	0.005	0.008	-0.068 ***	-0.095 ***	-0.043 ***	-0.040 ***	-0.035 ***	-0.063 ***	0.03	-0.18 **
	0.014	0.015	0.018	0.018	0.007	0.007	0.007	0.008	0.07	0.08
VIX	-0.007 ***	-0.017 ***	0.000	-0.012 ***	-0.002 ***	-0.013 ***	0.001 **	-0.012 ***	-0.28 ***	-0.34 ***
	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.00	0.01
Nobs	102,907	102,907	49,450	49,450	102,907	102,907	49,450	49,450	102,907	49,450
R2 within	0.0382	0.0453	0.0481	0.0629	0.0084	0.0240	0.0121	0.0436	0.1124	0.0916
Wald Chi2(8)	4,041.8	4,834.2	2,462.4	3,311.0	874.0	2,533.9	581.3	2,284.0	11,315.2	4,802.5

This table reports the results from difference-in-difference panel regressions that test for changes in average quote quality and trading activity for Nasdaq-listed and NYSE-listed U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. We use the following specification:

$$MQ_{i,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{i,t}, \quad (2)$$

where $MQ_{i,t}$ is a market quality measure (quote quality, trading activity) for stock *i* on day *t*, *Q*, *T* and *TA* are dummies that take on a value of one for stocks subject to the quote rule (Q), the trade rule (T), and the trade-at rule (TA), *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We cluster standard errors by firm and day. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Table IA.8.3. Changes in Market Quality for Nasdaq-Listed and NYSE-Listed Stocks: Collapsed Panel Regressions (Rules)

	Quoted Spread				log Depth				Volatility	
A. Quote Quality	Nasdaq		NYSE		Nasdaq		NYSE		Nasdaq	NYSE
	(dollar)	(%)	(dollar)	(%)	(shares)	(dollar)	(shares)	(dollar)	midquote	midquote
Intercept	0.0912 ***	0.0053 ***	0.0642 ***	0.0025 ***	1.937 ***	4.724 ***	1.801 ***	4.915 ***	0.0264 ***	0.0191 ***
	0.0044	0.0002	0.0022	0.0001	0.021	0.016	0.030	0.026	0.0021	0.0016
Event	0.0199 **	0.0009 **	0.0078 ***	0.0000	0.075 ***	0.087 ***	0.028 **	0.062 ***	0.0070 ***	0.0015
	0.0021	0.0002	0.0015	0.0001	0.006	0.009	0.012	0.015	0.0013	0.0010
Q*Event	0.0136 ***	0.0021 ***	0.0222 ***	0.0024 ***	0.767 ***	0.780 ***	0.737 ***	0.783 ***	0.0010	0.0065 ***
	0.0038	0.0003	0.0025	0.0001	0.011	0.015	0.021	0.023	0.0023	0.0016
T*Event	0.0017	-0.0001	-0.0019	-0.0006 ***	-0.046 ***	-0.049 ***	0.086 ***	0.085 ***	-0.0004	-0.0004
	0.0046	0.0003	0.0025	0.0001	0.015	0.017	0.022	0.022	0.0027	0.0019
TA*Event	-0.0018	0.0002	0.0015	0.0005 ***	0.031 *	0.049 ***	0.100 ***	0.062 *	0.0063 **	0.0059 ***
	0.0048	0.0003	0.0020	0.0001	0.018	0.018	0.027	0.032	0.0027	0.0021
VIX	0.0000	0.0001 ***	0.0000	0.0001 ***	-0.010 ***	-0.019 ***	-0.004 *	-0.017 ***	0.0004 ***	0.0003 ***
	0.0003	0.0002	0.0002	0.0000	0.002	0.001	0.002	0.002	0.0002	0.0001
Nobs	308	308	308	308	308	308	308	308	308	308
F-value	62.2	92.4	186.8	261.8	2,719.2	1,828.6	1,239.8	1,224.6	16.3	22.4

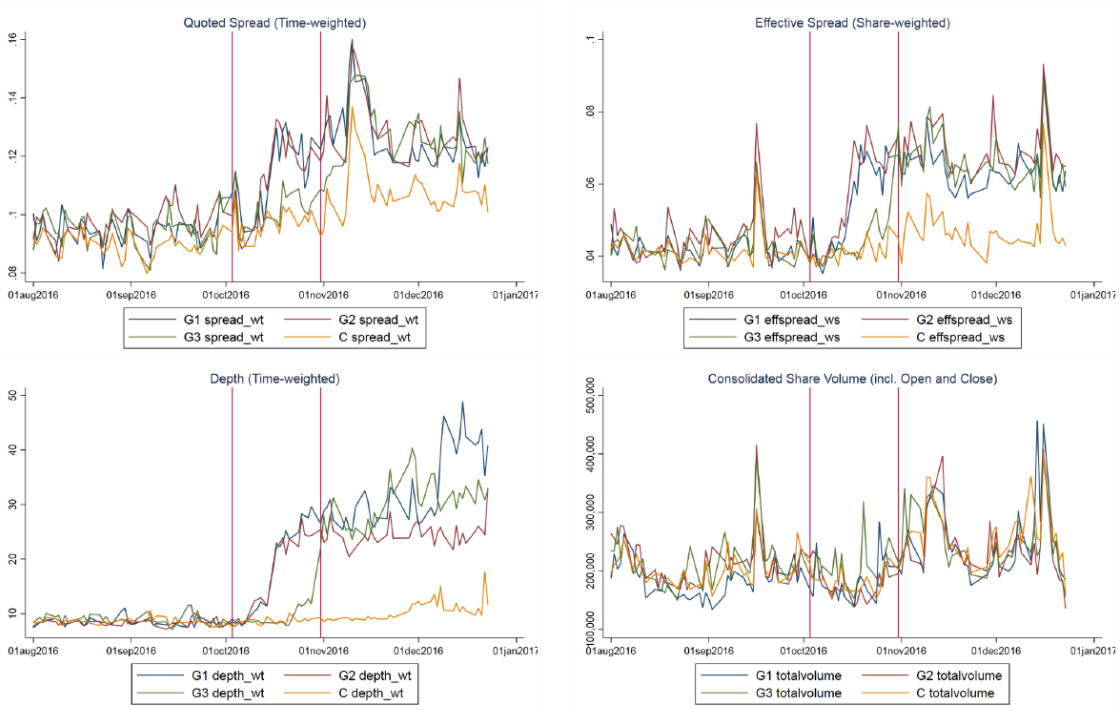
	log Volume				log Average Trade Size				Price	
B. Trading Activity	Nasdaq		NYSE		Nasdaq		NYSE		Nasdaq	NYSE
	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(shares)	(dollar)	(dollar)	(dollar)
Intercept	11.412 ***	14.197 ***	11.879 ***	14.985 ***	4.794 ***	7.579 ***	4.754 ***	7.866 ***	24.70 ***	30.82 ***
	0.058	0.066	0.068	0.074	0.011	0.012	0.012	0.016	0.04	0.43
Event	0.286 ***	0.299 ***	0.291 ***	0.324 ***	0.088 ***	0.070 ***	-0.004	0.029 ***	1.31 ***	1.30 ***
	0.047	0.048	0.047	0.017	0.007	0.008	0.006	0.008	0.21	0.25
Q*Event	-0.016	-0.001	-0.108	-0.058	0.072 ***	0.087 ***	0.060 ***	0.110 ***	0.48	1.25 ***
	0.065	0.066	0.069	0.069	0.010	0.013	0.011	0.010	0.30	0.40
T*Event	-0.062	-0.063	0.048	0.044	-0.012	-0.013	0.033 **	0.030 **	-0.09	-0.28
	0.067	0.068	0.074	0.074	0.012	0.015	0.013	0.014	0.39	0.47
TA*Event	-0.004	0.012	-0.039	-0.075	-0.051 ***	-0.034 **	-0.032 ***	-0.069 ***	0.26	-1.03 ***
	0.067	0.068	0.072	0.074	0.015	0.015	0.012	0.016	0.70	0.39
VIX	-0.006	-0.015 ***	0.002	-0.011 **	-0.003 ***	-0.012 ***	0.001	-0.012 ***	-0.27 ***	-0.35 ***
	0.004	0.005	0.005	0.005	0.001	0.001	0.001	0.001	0.03	0.03
Nobs	308	308	308	308	308	308	308	308	308	308
F-value	15.3	16.7	14.2	19.5	62.4	82.5	60.6	142.8	32.0	230.8

This table reports the results from difference-in-difference collapsed panel regressions that test for changes in average quote quality and trading activity for Nasdaq-listed and NYSE-listed U.S. tick size pilot sample stocks between the pre- and the post-pilot periods. For each day, we compute the cross-sectional average market quality measure for control stocks (C) and for stocks subject to each rule: the quote rule (Q), the trade rule (T), and trade-at-rule (TA), and then run the following collapsed panel regression:

$$MQ_{g,t} = \beta_0 + \beta_1 \cdot Q + \beta_2 \cdot T + \beta_3 \cdot TA + \beta_4 \cdot Event + \beta_5 \cdot Q \cdot Event + \beta_6 \cdot T \cdot Event + \beta_7 \cdot TA \cdot Event + \beta_8 \cdot X_t + \varepsilon_{g,t}, \qquad (5)$$

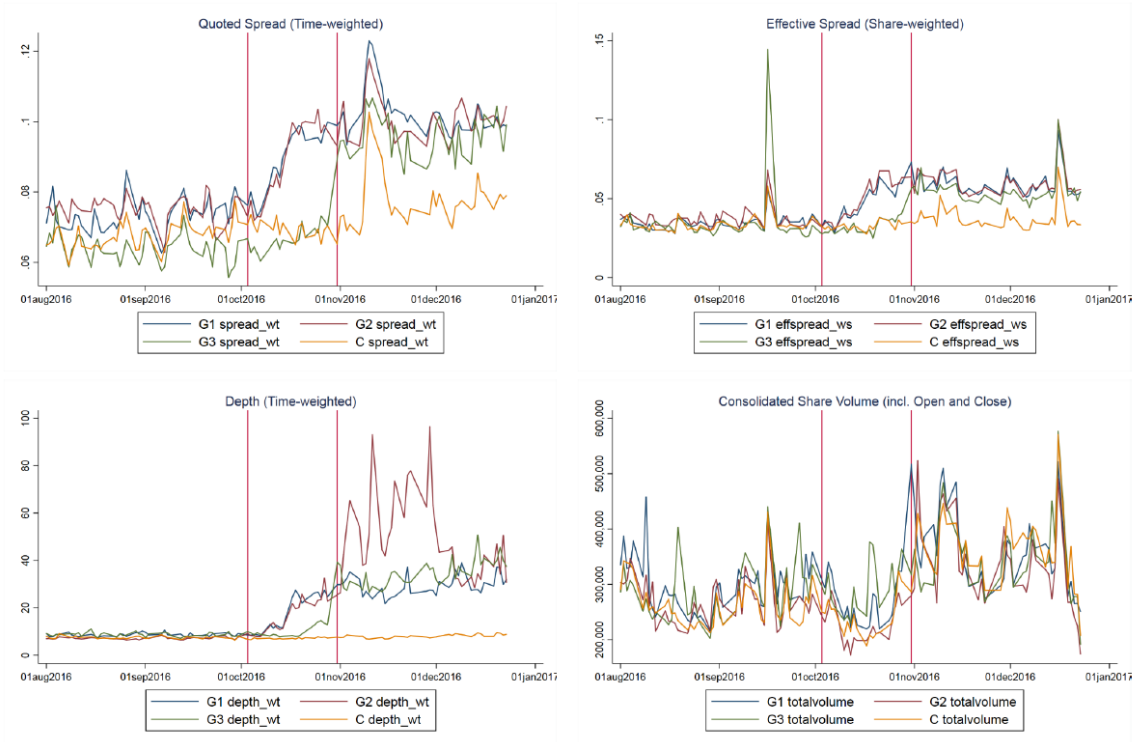
where $MQ_{g,t}$ is the average market quality measure (quote quality, trading activity) for stocks in group g on day *t*, *Q*, T and *TA* are dummies that take on a value of one for stocks subject to each rule, *Event* is a dummy that takes on a value of one for days in the post-period, and X_t is the VIX index which we use as a market-wide control variable. We use Newey-West standard errors with five lags. The pre-period is August 1 – September 23, 2016, and the post-period is October 31-December 23, 2016. Control stocks are those that will continue being quoted and traded in decimals, the quote rule applies to G1, G2, and G3, the trade rule applies to G2 and G3, and the trade-at rule applies to G3. Measures are calculated based on data from TRTH. Quoted Spreads are time-weighted, and Effective Spreads are share-weighted and both are measured in dollars and in percent of the midquote, Depth denotes the time-weighted NBBO depth and is reported in round lots of 100 shares and in dollars, and Volatility is the square root of the realized variance of midquote returns. Volume is consolidated volume including open and close measured in shares and in dollars while Average Trade Size is based on continuous trading only and is measured in shares and dollars. Price is the average daily share-weighted stock price in dollars. Furthermore, we report results for the logarithm of the following skewed variables: Depth, Volume, and Average Trade Size. The estimated coefficients for the group dummies are suppressed to conserve space. Standard errors are reported below the estimated coefficients, and *** designates significant at the 1% level, ** significant at the 5% level, and * significant at the 10% level.

Figure D1. Market Quality for Nasdaq-Listed Stocks



This figure plots the daily average market quality measures for Nasdaq-listed stocks clock-wise from the upper left hand corner: time-weighted quoted spread, share-weighted effective spread, depth, and consolidated share volume including open and close for control stocks C and for test groups G1, G2, and G3 respectively. The vertical lines indicate the beginning and the end of the phase-in period, October 3, trough October 31st 2016.

Figure D2. Market Quality for NYSE-Listed Stocks



This figure plots the daily average market quality measures for NYSE-listed stocks clock-wise from the upper left hand corner: time-weighted quoted spread, share-weighted effective spread, depth, and consolidated share volume including open and close for control stocks C and for test groups G1, G2, and G3 respectively. The vertical lines indicate the beginning and the end of the phase-in period, October 3, trough October 31st, 2016.