Asymmetric Trading Costs Prior to Earnings Announcements: Implications for Price Discovery and Returns

Online Appendix

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Abstract

In this Online Appendix, we provide supplementary results for the paper "Asymmetric Trading Costs Prior to Earnings Announcements: Implications for Price Discovery and Returns," including additional evidence on the connection between asymmetric liquidity provision, abnormal order imbalances, and returns; alternative hypotheses; cross-sectional variation; time-series variation; and robustness tests.

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Online Appendix A. Connecting ALP, AOI, and RET

This Online Appendix provides additional evidence that pre-announcement asymmetric liquidity provision (ALP), abnormal order imbalances (AOI), and abnormal returns (RET) are correlated. These results, together with the related evidence in the paper, indicate that these three phenomenon stem at least in part from a single underlying source, which is consistent with our frictions-based story but none of the alternatives we are aware of.

A.1. Event-time

Figure 1 plots average standardized values of ALP, AOI, and RET in event time around earnings announcements. It shows that the three variables share a strikingly similar pattern: they gradually rise before announcements, peak at t-1, and immediately drop off following the announcements.

To formally assess Figure 1, we conduct standardized regressions of the form:

$$z(Y_s) = c \cdot z(X_s) + \epsilon_s,$$

where $z(Y_s)$ and $z(X_s)$ are the values of Y_s and X_s demeaned and scaled so their standard deviations are 1. The unit of observation for these regression is a variable-day in event time, which are measured relative to the announcement date t. As a result, each regression has 21 observations in our t-10 through t+10 window, and the estimate $\hat{c}$ is the correlation coefficient of the lines plotted in Figure 4 of our revised paper.

Table 1 shows the results of these pairwise standardized regressions. In each case, the correlation coefficient is economically large, ranging from 45% to 86%, and statistically significant, which indicates that variation in ALP, AOI, and RET tend to move in concert when viewed in event-time relative to the announcement date.

A.2. Cross-section of firms

As a second approach to establishing cross-sectional correlations, we also compute firm-level measures of average ALP, AOI, and RET in event-time using a different approach to estimate ALP at the firm level.[2] Specifically, we estimate a regression designed to measure differences in reversal magnitudes depending on whether they are positive (indicating buy demands) or negative (indicating sell demands). We estimate ALP for each firm i on event-day s using the coefficients $b_{i,s}$ and $c_{i,s}$ from the following regression:

$$r_{i,q,s+1} = a_{i,s} + b_{i,s} r_{i,q,s} \mathbf{1}(r_{i,q,s} > 0) + c_{i,s} r_{i,q,s} \mathbf{1}(r_{i,q,s} < 0) + \epsilon_{i,q,s+1}, \tag{1}$$

where $r_{i,q,s}$ is the return for firm i in quarter q on day $t+s$ in event-time around the earnings announcement date t. We estimate this regression for all firms with at least 20 earnings announcements in our main sample by stacking all observations for a given firm from t-4 to t-2. The requirement of at least 20 announcements results in a sample of 3,937 firms. Because greater reversals result in more-negative coefficients, we estimate the asymmetry in liquidity provision as $c_{i,s} - b_{i,s}$ multiplied by -1 so that larger values indicate greater reversals following selling pressure compared to buying pressure.

Panel A of Table 2 shows that the average firm-specific estimates of ALP, AOI, and RET are all significantly positive in the pre-announcement window. Perhaps more importantly, mirroring the evidence in Table 7 of the paper, Panel B of Table 2 shows that all three firm-specific estimates are positively and significantly correlated, consistent with our story that these three empirical phenomenon all stem from the inventory management decisions of risk-averse intermediaries.

[2] As a reminder, our primary approach to estimating ALP uses cross-sectional differences in reversal magnitudes and can therefore cannot be applied to individual firms.

Online Appendix B. Evidence on Alternative Hypotheses

In this Online Appendix, we provide additional evidence and alternative models pertaining to three alternative hypotheses: asymmetric pre-announcement disclosures by managers, short-sale costs, and asymmetric private information.

B.1. Asymmetric pre-announcement disclosures

As noted in the paper, one alternative explanation for our findings is that they stem from firms selectively disclosing positive earnings news prior to their announcements, as in Roychowdhury and Sletten (2012). While this alternative would explain the observed return patterns conditional on the sign of earnings news, we argue in the paper that it would not explain our evidence of positive unconditional pre-announcement returns, order imbalances, or asymmetric liquidity provision without additional mechanisms such as investor irrationality, positive-feedback trading, and some other effect that creates asymmetry in pre-announcement trading costs.

To further develop this argument, we consider an alternative model in which firms selectively disclose good news relative to bad news prior to the announcement. This alternative model allows us to contrast the resulting empirical predictions of the two models and gauge which version yields predictions more closely aligned with our empirical results. Specifically, the timeline of the model with selective disclosure is as follows:

1. Managers decide whether to disclose the earnings news publicly before trade at time $t = -1$. Their disclosure decision is asymmetric: they disclose good news with probability d_g and bad news with probability d_b, where $d_g > d_b$.

2. If managers make a public news disclosure, prices move immediately to the fundamental price given the disclosed news and the trade at $t = -1$ involves no information asymmetry.

3. If managers do not make a public news disclosure, trading proceeds as in our main

model, with intermediaries providing liquidity to informed and uninformed traders.

To distinguish this alternative model from our main model, we set the intermediary's preference for positive inventory ρ to zero, making the model symmetric except for the disclosure probabilities.

Figure 2 illustrates the equilibrium in this alternative model. The first set of graphs show the equilibrium in a rational framework in which investors and intermediaries understand that managers are more likely to pre-disclose bad news. The second set of graphs show a related equilibrium in a behavioral framework in which agents believe disclosure is symmetric ($d_b = d_g$), despite the fact that it is not. In both cases, liquidity provision is symmetric and unaffected by the disclosure asymmetry; the quote midpoint is zero and the bid-ask spread is the same regardless of the disclosure asymmetry. This reflects the aforementioned inability of the selective disclosure theory to explain our evidence on asymmetric liquidity provision.

Similarly, we find that order sizes used by informed traders for buy and sell orders are the same conditional on no pre-trade disclosure. In both the rational and behavioral model, we do not observe the abnormally positive order flow predicted by our main model and that we observe empirically. In fact, in the rational model when there is no pre-disclosure, we observe slightly larger *sell* orders because risk-averse traders who receive a negative signal can be confident when shorting the stock that good news is likely to have been pre-disclosed.

The bottom graphs in Figure 2 show average prices in the selective disclosure model. In both the rational and behavioral models, average prices conditional on disclosure are positive because of the disclosure bias. However, in the rational model, the average price conditional on no disclosure is negative because the agents rationally understand that no news is bad news. As a result, average prices in the rational model are equal to fundamental value. However, in the behavioral model, agents do not understand that disclosure is asymmetric and so average prices conditional on no disclosure are zero (the unconditional average firm value). We therefore have that average pre-announcement prices are increasing in the degree of asymmetric disclosure.

Together, the graphs in Figure 2 illustrate the main conclusion from our alternative model: that a behavioral asymmetric disclosure model provides an alternative explanation for our asymmetric price discovery results, as well as our average return results when combined with a behavioral bias, but does not explain our liquidity provision or order flow results.

We supplement our theoretical analysis with empirical tests designed to test whether asymmetric disclosure stories are likely to explain our main findings. To rule out this alternative empirically, we would ideally like to show that traders possess negative signals but are discouraged from trading on them in equity markets.

We are unable to observe traders receiving negative signals directly, however, we can provide evidence that market participants are informed about the sign and magnitude of upcoming earnings announcements by studying directional bets placed in the options markets. Although market making and price discovery across equity and options markets are linked, we expect that option market liquidity providers are less likely to face directional net exposure to earnings announcement and thus are less likely to provide liquidity asymmetrically.

To test this hypothesis, we obtain daily options data from IVY OptionMetrics and examine the link between earnings surprises and evidence of directional bets placed in the options market in the days leading up to firms' announcement. Following Cremers and Weinbaum (2010), we look for evidence of directional trading in options markets by measuring differences in implied volatilities of call and put options with the same maturity date and underlying stock. Specifically, we measure implied volatility spreads as the difference in implied volatility across standardized at-the-money call and put options of the same strike price and expiration date. We look for evidence of pre-announcement informed trade by measuring the implied volatility spread from t-4 to t-2. To mitigate longer-trends in directional trades, we standardize the pre-announcement implied volatility spreads using the mean and standard deviation for the firm from t-11 to t-51. We also control for contemporaneous equity market returns, RET(-2,-4), to highlight the distinction between equity and option markets. The sample for this analysis consists of 107,270 earnings announcements with standardized pre-announcement option data spanning 1996 through 2012.

Table 3 presents regressions of abnormal pre-announcement implied volatility spreads on the earnings surprise and additional controls. Column (1) shows that abnormal implied volatility spreads prior to earnings announcements are positively related with the earnings surprises, consistent with investors trading on earnings news ahead of the actual announcement. Columns (2) and (3) of Table 3 partition the sample across good versus bad news announcements and show that the link between earnings surprises and directional options trading holds regardless of the sign of earnings news. Most importantly, the positive relation in column (3) suggests that informed market participants are aware of negative earnings surprises ahead of the actual announcements.

B.2. Short-sale costs

Another possible alternative hypothesis we address in the paper is that increasing short-sale costs prior to earnings announcements could explain our results. It is well established that in a model with short-sale costs and disagreement (e.g. Miller (1977)) there can be an upward bias in prices. Furthermore, short-sale costs would naturally result in average order imbalances being positive. We address this possibility both theoretically and empirically in the discussion below.

On the theoretical front, we find that short-sale costs alone would not explain our other main result: the asymmetry in liquidity provision. If anything, intermediaries would attract sellers by *decreasing* the cost of selling (i.e., by raising the midpoint quote), the opposite of our model's prediction and empirical results. The intermediary decreases the cost of selling to elicit symmetric order flow and profit from crossing orders while minimizing inventory risk. We illustrate this point in a simple modified version of our model in which there is no asymmetry driven by intermediary's preference for positive inventory (i.e. $\rho = 0$) but there is a short-sale cost s. Specifically, we assume sell orders require paying a fraction s of their value to a third party outside the model.

Figure 3 illustrates the equilibrium in this simple model. As discussed above, the asymmetry between buy and sell order sizes increases as s increases, as does the upward bias in pre-announcement prices caused by disagreement and short-sale costs. However, quote midpoints slightly *increase* (rather than decrease) with s, contrary to our empirical evidence and our inventory-based model.

Empirically, we examine the role of short-sale constraints using the exogenous shock created by Regulation SHO, as in Diether, Lee, and Werner (2009). Specifically, we examine market behavior around earnings announcements during the 2005-2007 window of Regulation SHO as a function of whether the firm was subject to the SEC's experiment. Our variable of interest is Treatment, an indicator variable for whether the firm's stock was temporarily exempt from the bid-test or uptick rule restricting short-sales.

In Panel A of Table 4 we examine the link between Treatment and pre-announcement returns. These tests show that there is no significant relation between a firm's treatment status and the pattern in pre-announcement returns that our paper seeks to explain. Similarly, Panel B of Table 4 shows that there is no significant relation between a firm's treatment status and asymmetries in pre-announcement liquidity provision. Together, these results mitigate concerns that our results are driven by restrictions on short-selling behavior.

B.3. Asymmetric private information

In the body of the paper we address the alternative hypothesis that asymmetric private information could explain some of our results. To further develop this point, in this Online Appendix we also consider an alternative model in which informed traders are more likely to receive a private signal ahead of positive news announcements. Specifically, the timeline of the alternative model is:

1. Informed traders receive a signal prior to $t = -1$ with probability n_g if the announcement is good and n_b if the announcement is bad, where $n_g \geq n_b$.

2. Trade proceeds as in the model at $t = -1$.

3. v_0 is announced publicly at $t = 0$.

To distinguish this alternative model from our main model, we set the intermediary's preference for positive inventory ρ to zero, making the model symmetric except for the information acquisition probabilities. When $n_g = n_b = 1$, this alternative model is identical to the $t = -1$ stage of the main model with $\rho = 0$.

Figure 4 illustrates the equilibrium in this alternative model. When information acquisition is symmetric ($d_g = d_b$), the model is fully symmetric and so the average quote midpoint is zero (the average fundamental value), buy and sell orders have the same quantity, and average prices are equal to zero.

As the asymmetry in information acquisition increases, intermediaries respond by increasing the midpoint of the bid-ask spread to (1) discourage buy orders because they come with additional adverse selection, and (2) attract more offsetting sell orders. This endogenous intermediary response is the opposite of what we observe empirically, namely that buy orders become cheaper relative to sell orders prior to announcements. However, due to the asymmetry in information acquisition, traders are more likely to receive positive signals and therefore the average pre-announcement price increases, which is consistent with the empirical evidence. Together, these results indicate that a demand-side information acquisition story can give rise to positive returns prior to the announcements but would fail to explain the evidence we provide of an asymmetry in trading costs prior to announcements.

To empirically address this point, Table 5 examines the link between pre-announcement order imbalances and the extent of adverse selection. We conduct these tests using a multimarket measure of information asymmetry among traders from Johnson and So (2016a), denoted as MIA, where higher values indicate greater adverse selection.[3] Under the asymmetric adverse selection alternative hypothesis, order imbalances should be correlated with the extent of information asymmetry. However, Table 5 shows there is no significant relation

[3]We use MIA in place of alternative proxies such as the adverse selection component of the bid-ask spread because the identifying assumption in spread decomposition models is that liquidity- or inventory-driven price pressure immediately reverses *intraday*, whereas our results show this assumption is likely invalid because reversals commonly occur across trading days. Similarly, we do not use more coarse estimates, such as PIN, because they involve estimating model parameters over a time-series and thus cannot be estimated at shorter intervals, including the daily level.

between pre-announcement AOI and either the level of, or changes in, MIA. The insignificant relations are inconsistent with adverse selection-based alternatives, in either direction, being a primary driver of our findings.

Online Appendix C. Cross-Sectional Results

C.1. Verified versus unverified announcements

Our story hinges on intermediaries anticipating the timing of firms' earnings announcements. To examine this point empirically, we employ data on firms' expected earnings announcement dates from Wall Street Horizon, which began providing real-time earnings calendar data to institutional clients in 2006. These data are also used and described in deHann, Shevlin, and Thornock (2015) and Johnson and So (2016b).

When studying announcement timing, there are two key issues relevant for our setting. The first is that there is a strong positive relation between the speed with which firms report earnings and the nature of their earnings news. Prior studies such as Penman (1984) and Bagnoli, Kross, and Watts (2002) show firms with positive news tend to announce earlier than expected and vice versa. The correlation between announcement timing and earnings news is potentially problematic in our setting because unanticipated early announcements are more likely to convey positive news. As a result, pre-announcement returns and order imbalances are likely positive for these unanticipated earnings announcements as information about earnings gradually flows into pre-announcement prices. The effect of a firm not reporting on its expected announcement date is also different for early announcements than late announcements because earlier-than-expected announcements are more likely to come as a surprise, whereas investors can infer that earnings are more likely to be bad when firms do not report on time (Bagnoli, Kross, and Watts (2002)).

A second key issue is that, as shown in deHann, Shevlin, and Thornock (2015) and Johnson and So (2016b), expected announcement dates tend to be highly accurate and rarely off by more than one day. The accuracy of the earnings calendar data poses a challenge for studying the effects of unanticipated announcements because there are very few observations with sufficient separation between the expected and actual announcement date to study price discovery in the days prior to an unanticipated announcement.

The Wall Street Horizon data provides an alternative way to study how intermediaries' foreknowledge of the announcement date impacts our results. Specifically, instead of conditioning on reporting early versus late, we condition on whether a firm publicly verifies its expected announcement date ahead of the actual announcement. Wall Street Horizon keeps track of verified announcement dates by monitoring firms' press releases and their media relations webpages. By examining whether a firm verifies its announcement date, we can proxy for the likelihood that traders and financial intermediaries know the expected timing of news ahead of the actual announcement.[4]

Panel A of Table 6 examines how pre-announcement returns and abnormal order imbalances depend on whether firms verify their earnings announcement dates over the fifty trading days ending five days ahead of the actual announcement. The corresponding sample consists of 76,711 earnings announcements from 2006 through 2012, with 58,385 verified announcement dates and 18,386 non-verified dates.

Panel A of Table 6 shows that pre-announcement returns and abnormal order imbalances are greater when firms verify their announcement dates in advance, consistent with the mechanism we propose being stronger when intermediaries are more likely to know the timing of the announcement. These effects also hold after controlling for the analyst-based earnings surprise, which mitigates concerns that a positive correlation between verification and firms' earnings news contaminates our results.

Similarly, Panel B of Table 6 shows that pre-announcement asymmetric liquidity provision (ALP) is only significant for firms with verified announcement dates and that abnormal ALP

[4]Earnings announcements can be classified as non-verified in these test for several reasons including firms not disclosing a week in advance of the announcement or firms disclosing the announcement date sufficiently far in advance that doing so does not register with Wall Street Horizon. Our tests rely on the assumption that the availability of expected announcement dates in the dataset are positively correlated with the likelihood that market participants know the timing of the announcement before it occurs.

is also significantly greater for verified announcements. These results are again consistent with our main results being stronger for firms when the intermediaries are aware of the announcement timing in advance.

C.2. Non-earnings 8-K filings

We also take another approach to comparing anticipated and unanticipated announcements by using 'placebo' tests based on 8-K filings as event dates. To avoid confounding these tests with the impact of earnings announcements, we exclude all 8-Ks filed within 10 days of firms' quarterly earnings announcements, resulting in a sample of 161,051 observations. Because these events are less likely to be anticipated, we would not expect to see a discernible pattern in pre-filing returns, price discovery, liquidity provision, or order imbalances. Table 7 confirms that this is indeed the case, with no significant pattern in abnormal order imbalances, asymmetric liquidity provision, or returns prior to 8-K filings.

C.3. Uncertainty-return relation

Table 6 of the paper shows that, on average, high uncertainty firms underperform low uncertainty firms during their announcements, which may cause researchers to conclude that there is a *negative* "uncertainty premium". Such a conclusion would be puzzling because investors appear to earn lower returns when investing in higher risk stocks and vice versa. However, to shed light on the validity of this conclusion, Figure 5 plots the average difference in cumulative event-time returns across quintiles sorted by a composite uncertainty proxy, IU, calculated as the sum of the three uncertainty proxies from Table 6 of the paper (VLTY, EVOL, and -1*AGE), where all three measures are standardized each quarter to have a zero mean and unit standard deviation.

The average cumulative return and 95% confidence interval in Figure 5 shows there is no significant difference in cumulative returns across high and low uncertainty firms in the month surrounding firms' announcements. However, the cumulative return spread becomes temporarily significant pre-announcement before becoming insignificant again following the announcement. Combining this longer-window evidence with the shorter-window evidence from Table 6 of the paper demonstrates a narrow focus on short-window announcement returns may cause researchers to conclude there is a significant uncertainty return premium at announcements whereas the longer window view casts significant doubt on that interpretation because risk premia should not immediately reverse after the realization of risk.

Taken together, the findings in Table 6 of the paper and Figure 5 illustrate one of the central implications of our paper for future research: longer-window returns are needed to estimate risk premia and/or earnings news associated with earnings announcements due to failures of the unbiased and timely assumptions underlying short-window announcement returns. At a minimum, these findings suggest researchers should examine both short- and longer-window returns (i.e., weeks or months) when estimating risk premiums associated with anticipated information events such as earnings announcements.

Online Appendix D. Time-Series Results

D.1. Changes in broker-dealer leverage

The analyses in our paper offer a joint test of financial intermediaries' exposure to announcement risks and the implications of this exposure for how intermediaries provide liquidity. We focus on the sector as a whole, rather than a specific subsection such as designated market makers, because an asset's liquidity is shaped by interactions between traders and intermediaries across several mediums, including upstairs markets, block-crossing, and traditional exchange trading. Table 8 in this appendix supplements Table 8 of the paper by providing a direct link to the financial intermediary sector by exploring the time-series implications of Empirical Prediction 4 that our findings should be most pronounced when intermediaries prefer to reduce their net positions.

Adrian and Shin (2010) and Adrian, Etula, and Muir (2014) show financial intermediaries are positively exposed to the market and pro-cyclically adjust their balance sheet positions. As a result, we expect that time-series changes in the aggregate balance sheets of financial intermediaries reflects variation in their preference to expand versus contract their positions and, thus, their willingness to provide liquidity to buyers versus sellers.

To test this prediction, Table 8 presents the averages of ALP and returns surrounding earnings announcements across calendar quarters partitioned by changes in broker-dealer leverage, LevFac, which is defined as the seasonally adjusted log change in the level of broker-dealer leverage as constructed in Adrian, Etula, and Muir (2014). Calendar quarters are ranked into quartiles within each calendar year to control for long-run trends in broker-dealer leverage, where the highest (lowest) quartile of LevFac corresponds to quarters with the greatest increase (decrease) in broker-dealer leverage within a given year.[5]

Table 8 shows that our main findings are most pronounced in periods when financial intermediaries are scaling down their leverage by reducing their balance sheet positions. Specifically, ALP is more than three times as large in quarters where intermediaries are reducing leverage (i.e., low LevFac quarters) compared to quarters where intermediaries are increasing leverage (i.e., high LevFac quarters). Similarly, Panel B shows the average excess pre-announcement return is 48 basis points (t-statistic = 4.289) in low LevFac quarters compared to just 7 basis points (t-statistic = 1.278) in high LevFac quarters. Note that this result cannot be explained by trends in the overall market because we use excess returns. Together, this evidence is consistent with pre-announcement asymmetries in trading costs being most pronounced when intermediaries prefer to reduce their net exposure.

Online Appendix E. Comparative Statics in Our Model

Figure 6 illustrates how our model's equilibrium varies with the key exogenous parameters: ρ, γ_M, and σ. More specifically, Figure 6 depicts variation in the optimal quantities Q_{-2} and Q_{-1}; equilibrium bid-ask spreads and quote midpoints; optimal trader order sizes at $t = -1$; and finally average transaction prices at $t = -1$.[6] These graphs are designed to illustrate how variation in our key exogenous parameters affect the predictions of our model.

The first set of graphs in Figure 6 illustrate the impact of varying intermediaries' pref-

[5] In untabulated tests, we find even stronger results sorting the full time-series of quarters by LevFac.
[6] Average transaction prices at $t = -2$ are always 0.

erence for positive inventory, ρ, on the magnitude of our main results. When $\rho = 0$, the model is completely symmetric because the target inventory is 0, making the average quote midpoints equal to fundamental value, buy and sell order sizes identical, and average $t = -1$ prices equal to fundamental value. However, as ρ increases, target inventory at $t = -1$ increases slower than Q_{-2}, resulting in asymmetric liquidity provision, asymmetric order sizes, and an upward bias in pre-announcement prices.

The second set of graphs illustrate the impact of varying the intermediary risk-aversion, γ_M in the model. As γ_M increases, intermediaries are less willing to take on non-zero inventories and so Q_{-2} and target Q_{-1} decrease, while bid-ask spreads increase to compensate for any inventory they are forced to take. These increases in bid-ask spreads cause order sizes to decrease and average transaction prices to increase.

Finally, the third set of graphs show that changes in σ^2, like changes in ρ and γ_M, have a significant impact on our main results. When $\sigma = 1$, the announcement news is no different from the normal ($t = -2$) news, making target Q_{-1} the same as Q_{-2}. Without this dynamic change in target inventory, intermediaries provide liquidity symmetrically and there is no bias in pre-announcement order flow or prices. However, as σ^2 increases above one, target Q_{-1} decreases faster than Q_{-2}, resulting in an increasing asymmetry in liquidity provision and bias in pre-announcement order flow and prices.

Together, the schematics in Figure 6 provide a high-level overview of our hypothesis about the impact of frictions in the intermediary sector on asset prices around information events. They illustrate how the exogenous factors in our model, namely the intermediary's risk aversion and preference for positive inventory, cause intermediaries to provide liquidity asymmetrically, which in turn causes asymmetric order flow and an upward bias in pre-announcement prices.

Online Appendix F. Empirical Robustness

F.1. Other measures of asymmetric trading costs

In Table 9, we provide further evidence of asymmetries in pre-announcement transaction costs by using intra-day data to examine the link between abnormal buy/sell behavior and within-firm changes in price impact and quoted ask depth. We calculate intraday order imbalances for each trading day as the difference between buyer- and seller-initiated volume, scaled by total volume, using the Lee and Ready (1991) algorithm applied to the Trade and Quote (TAQ) database. To mitigate the influence of firm-specific trends in buying-vs-selling behavior, we compute standardized order imbalances by subtracting the average daily order imbalance from t-51 to t-11 and scaling by the standard deviation over that window.

Table 9 contains results from regressing abnormal transaction cost measures on abnormal order imbalances (AOI), which are both averaged over t-4 to t-2. The three transaction cost measures we employ are (1) Amihud Illiquidity Ratio, ALR, defined as the ratio of absolute return to dollar volume, (2) effective spreads, calculated from intraday TAQ data as the average absolute distance between a transaction's price and the bid-ask midpoint quote, scaled by the midpoint quote, and (3) quoted ask depth, also calculated from TAQ as the average offer size of intraday quotes.[7] All three transaction cost proxies are also standardized by their mean and standard deviation from t-51 to t-11, allowing us to measure how order imbalances result in abnormal asymmetries in transaction costs for selling versus buying in the days leading up to firms' announcements.

Columns (1) through (4) of Table 9 show that pre-announcement abnormal net selling behavior is associated with an increase in effective spreads and ALR, which is consistent with traders incurring abnormally high price impact when selling compared to buying leading up to the announcements. Similarly, columns (5) and (6) show that pre-announcement depth decreases in periods of net selling behavior, which is consistent with financial intermediaries becoming less willing to provide liquidity to sellers prior to the release of earnings news.

[7] Our results are qualitatively identical using bid depth or average depth in place of ask depth.

F.2. Longer pre-announcement window

To assess how robust our findings are to using a slightly larger pre-EA window, Table 10 reproduces our ALP results using t-6 to t-2 in place of our baseline t-4 to t-2 window. Table 10 shows that our results are indeed robust to the use of this alternative window. Note that we do not re-estimate our AOI or return results because they are shown for each trading day, rather than aggregated for the pre-announcement window. We focus on a three-day pre-announcement window in the revised paper to make the magnitudes comparable with the three-day announcement window commonly used in other studies.

F.3. Pre-sample (1983-1992)

Our frictions-based hypothesis would predict stronger results prior to our main 1993-2012 sample period because intermediaries were primarily NYSE floor specialists with more exposure to inventory risk. We test this hypothesis by estimating our main results in an earlier 1983-1992 sample period. Due to the limited availability of IBES data prior to 1993, the earlier sample is significantly smaller and tilted toward larger firms. This tilt has a potentially large impact on our results because, like many frictions-based phenomenon, our results are stronger among smaller, less liquid, more-volatile firms.

To assess the relative magnitude of pre-announcement asymmetries in the pre- and post-1993 sample period while addressing the difference in sample composition, Table 11 contains a comparison of our findings in both sample windows when value-weighting observations. Specifically, we present value-weighted average returns and abnormal asymmetric liquidity provision (ΔALP) prior to earnings announcements. We do not include buy-sell imbalances in these analyses because they are not available through TAQ prior to beginning of our main sample in 1993.

Consistent with our hypothesis, Table 11 shows pre-announcement biases in price discovery towards good news are indeed significantly larger in the earlier sample period. Specifically, Panel A shows that the magnitude of pre-announcement returns, relative to announcement window returns, is significantly higher in the earlier sample. Similarly, Panel B shows that abnormal asymmetric liquidity provision is both larger and of greater statistical significance in the earlier sample. By focusing on larger firms in both samples, our findings are consistent with the pre-announcement asymmetries being not only present in earlier samples but potentially of greater economic and statistical significance.

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Figure 1: Average ALP, AOI, and RET in Event Time

This figure presents average ALP, AOI, and RET in event time around firm's quarterly earnings announcement dates t. ALP is defined as the difference in reversal patterns across firms within the lowest quintile of returns over the prior day ("losers") and firms within the highest quintile of returns over the prior day ("winners"), constructed as the difference between returns earned from buying prior day losers and returns earned from selling prior day winners. AOI is abnormal order imbalances. Order imbalances equals the difference between buyer- and seller-initiated trading volume, calculated from intraday trade and quote data using the Lee-Ready algorithm. We calculate a firm's daily AOI by standardizing the order imbalance using the mean and standard deviation of the firm's order imbalances from t-51 to t-11. RET equals the daily market-adjusted return. For each day in event time, we average each variable across firms with each calendar quarter, and compute the time-series average across quarters. We standardize each series of event-time averages to make them comparable.

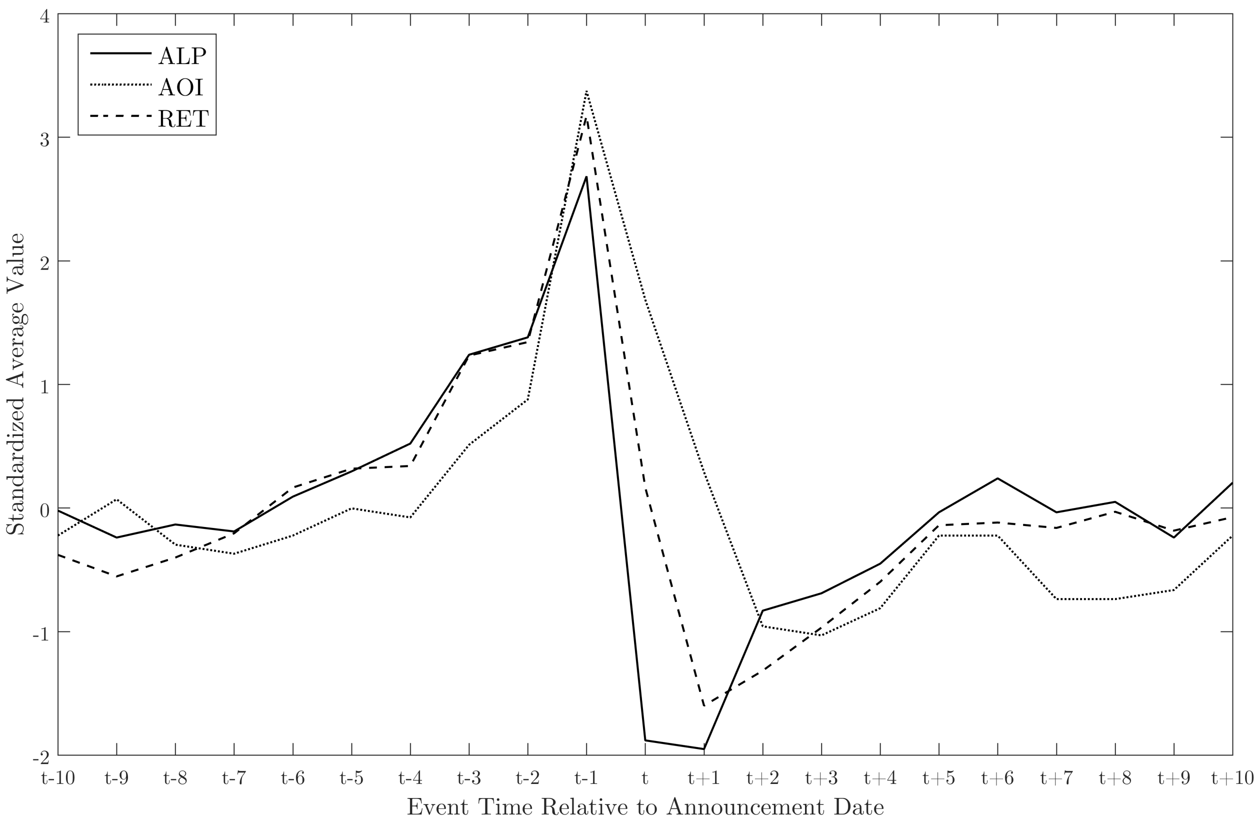

Figure 2: Alternative Model with Asymmetric Disclosure

This figure plot comparative statics for an alternative model in which firms sometimes disclose earnings news prior to trading at $t = -1$. This disclosure happens with probability d_g for good news announcements and d_b for bad news announcements. To distinguish this alternative from our main model, there is no asymmetry in liquidity provision. These figures show how changes in the extent of asymmetric disclosure ($d_g - d_b$) affect equilibrium quote midpoints and spreads at $t = -1$, buy and sell order sizes traders use at $t = -1$, average prices at $t = -1$, average prices at $t = -1$ conditional on whether there is a disclosure, and average prices at $t - 1$ conditional on the sign of earnings news. We use parameters $p = 0.65$, $\rho = 0$, $\gamma_m = 0.02$, $\gamma_t = 0.01$, and $\sigma^2 = 3$, $d_b = 0.05$ and vary d_g from 0.05 to 0.15. In the first set of figures, all agents are fully rational. In the second set, all agents make the mistake of assuming disclosure is symmetric, namely $d_g = d_b$. Quotes, midpoints, and average prices at $t = -1$ are measured relative to the fundamental value conditional on public information $\tilde{v}_{-1}$.

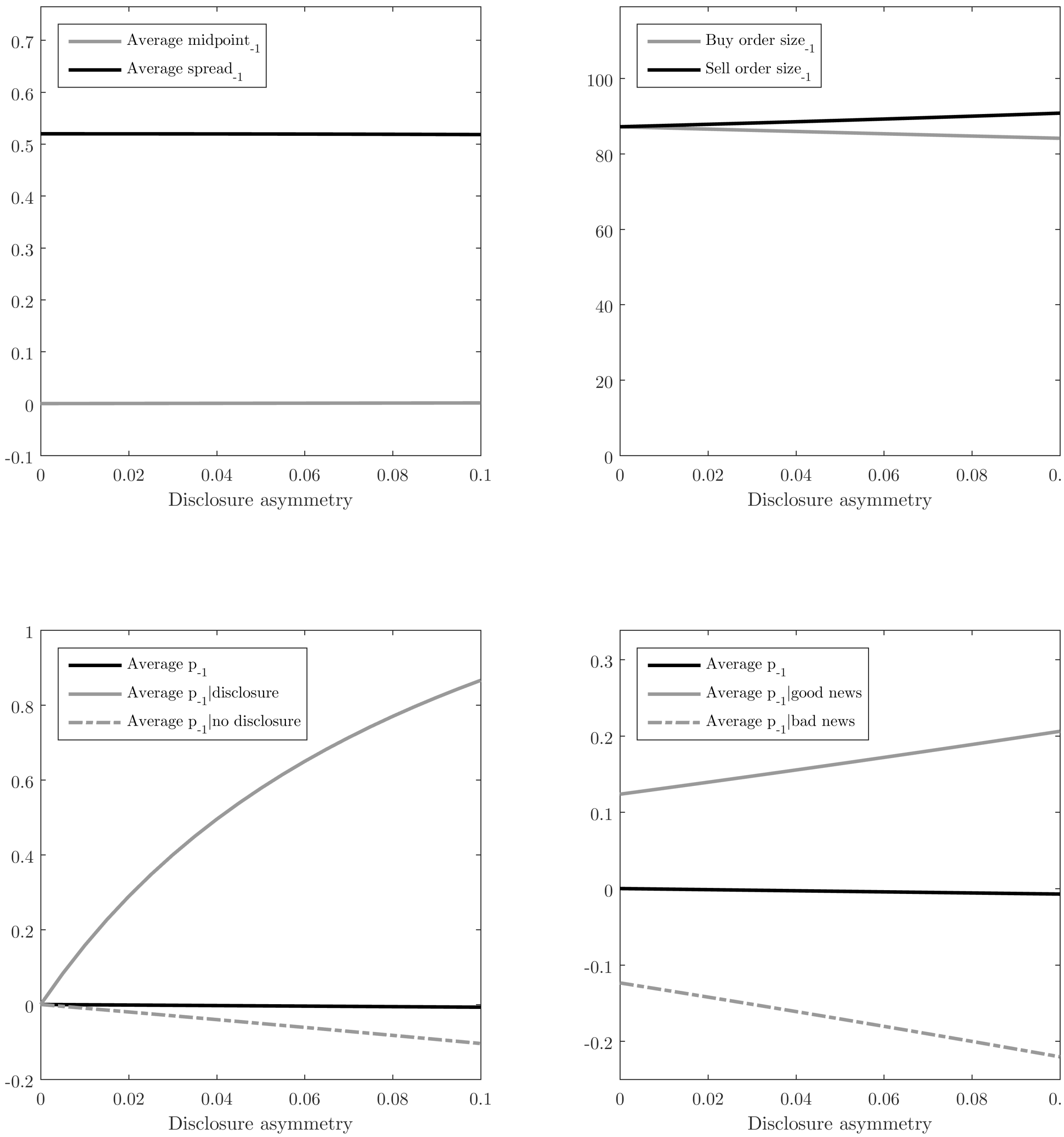

Figure 2: Alternative Model with Asymmetric Disclosure (behavioral)

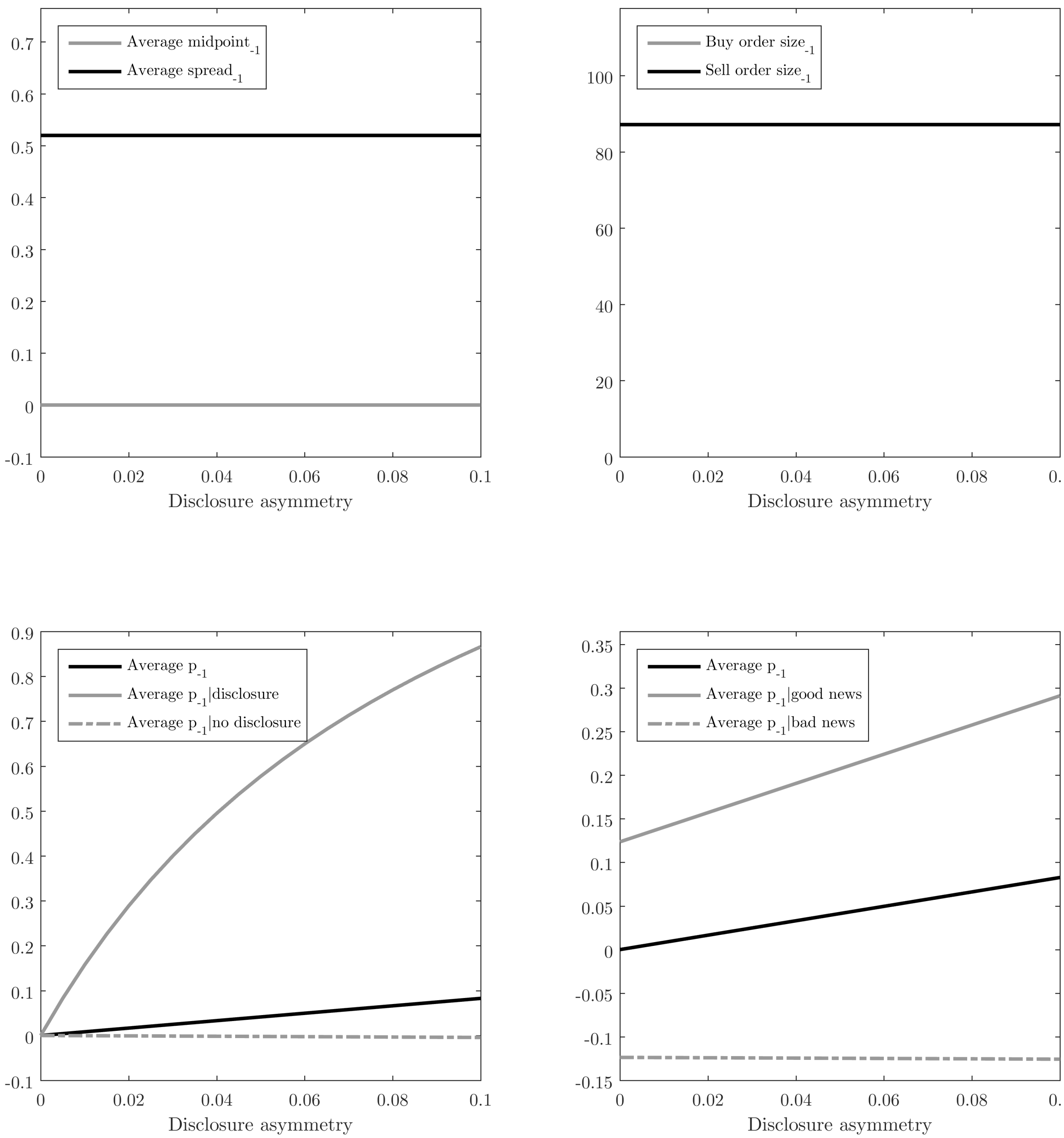

Figure 3: Comparative Statics in a Modified Model with Short-Sale Costs

This figure plots comparative statics for a modified version of our model with short-sale costs but no exogenous preference for positive inventory. The three panels illustrate how the equilibrium changes as we increase s, the percent cost of short-sales paid to a third party (not the intermediary). The first plot shows changes in the equilibrium quote midpoints and spreads at $t = -1$. The second plots shows buy and sell order sizes traders use at $t = -1$. The third plot shows average prices at $t = -1$, as well as average prices conditional on the sign of earnings news. Quotes, midpoints, and average prices at $t = -1$ are an average across possible $t = -2$ order flows, and measured relative to the fundamental value $\tilde{v}_{-1}$. We use parameters $p = 0.65$, $\rho = 0$, $\gamma_m = 0.01$, $\gamma_T = 0.02$, and $\sigma^2 = 3$, and vary s from 0 to 0.2.

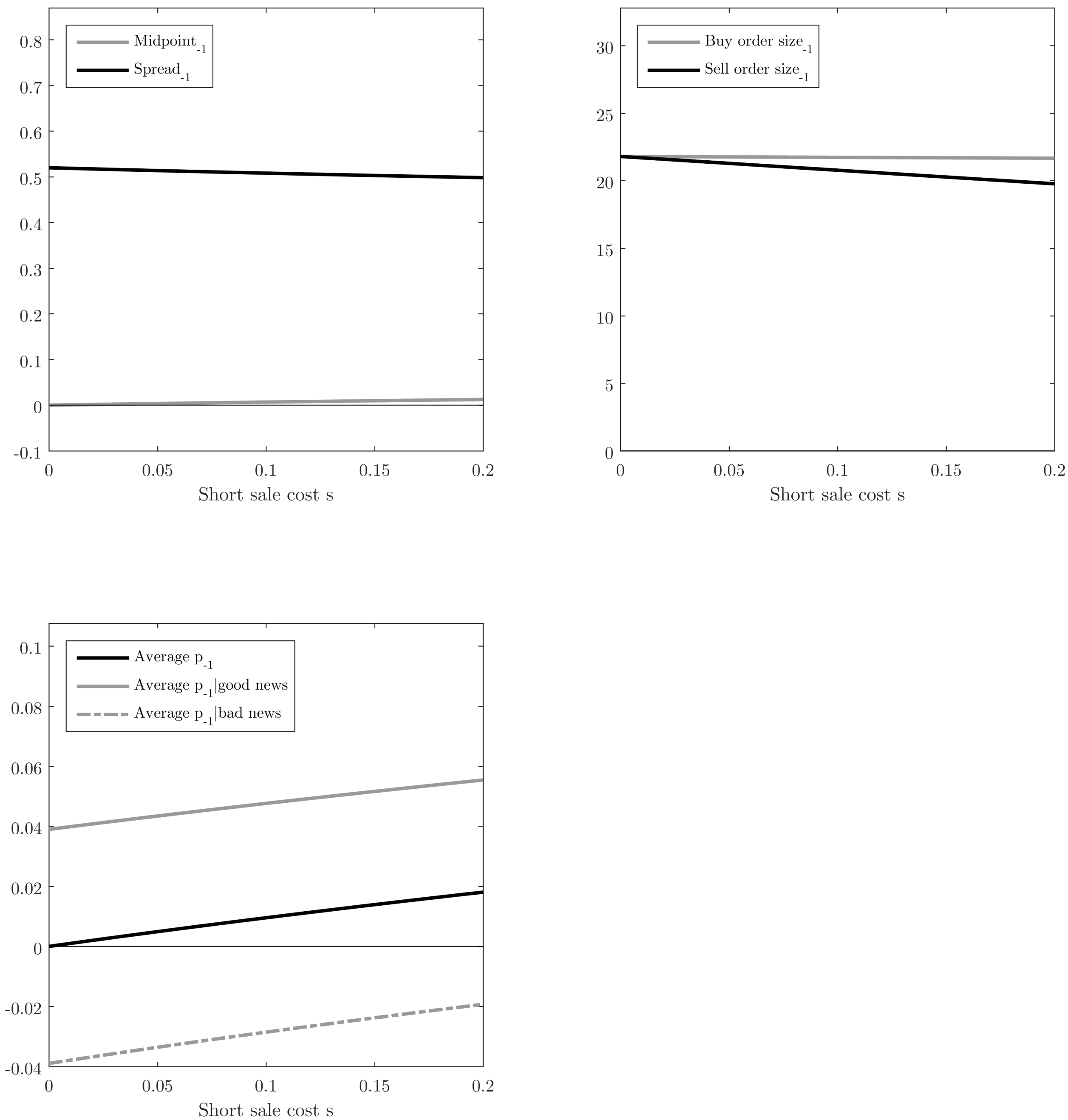

Figure 4: Alternate Model with Asymmetric Information Acquisition

This figure plots comparative statics for an alternative model in which informed traders are more likely to learn about good news than bad news prior to trading at $t = -1$. To distinguish this alternative from our main model, there is no asymmetry in liquidity provision. These figures show how changes in the extent of asymmetric information acquisition $(d_g - d_b)$ affect equilibrium quote midpoints and spreads at $t = -1$, buy and sell order sizes traders use at $t = -1$, average prices at $t = -1$, and average prices at $t - 1$ conditional on the sign of earnings news. We use parameters $p = 0.65$, $\rho = 0$, $\gamma_m = 0.02$, $\gamma_t = 0.01$, and $\sigma^2 = 3$, $d_b = 0.4$ and vary d_g from 0.4 to 0.5. Midpoints and average prices at $t = -1$ are measured relative to the fundamental value conditional on public information $\tilde{v}_{-1}$.

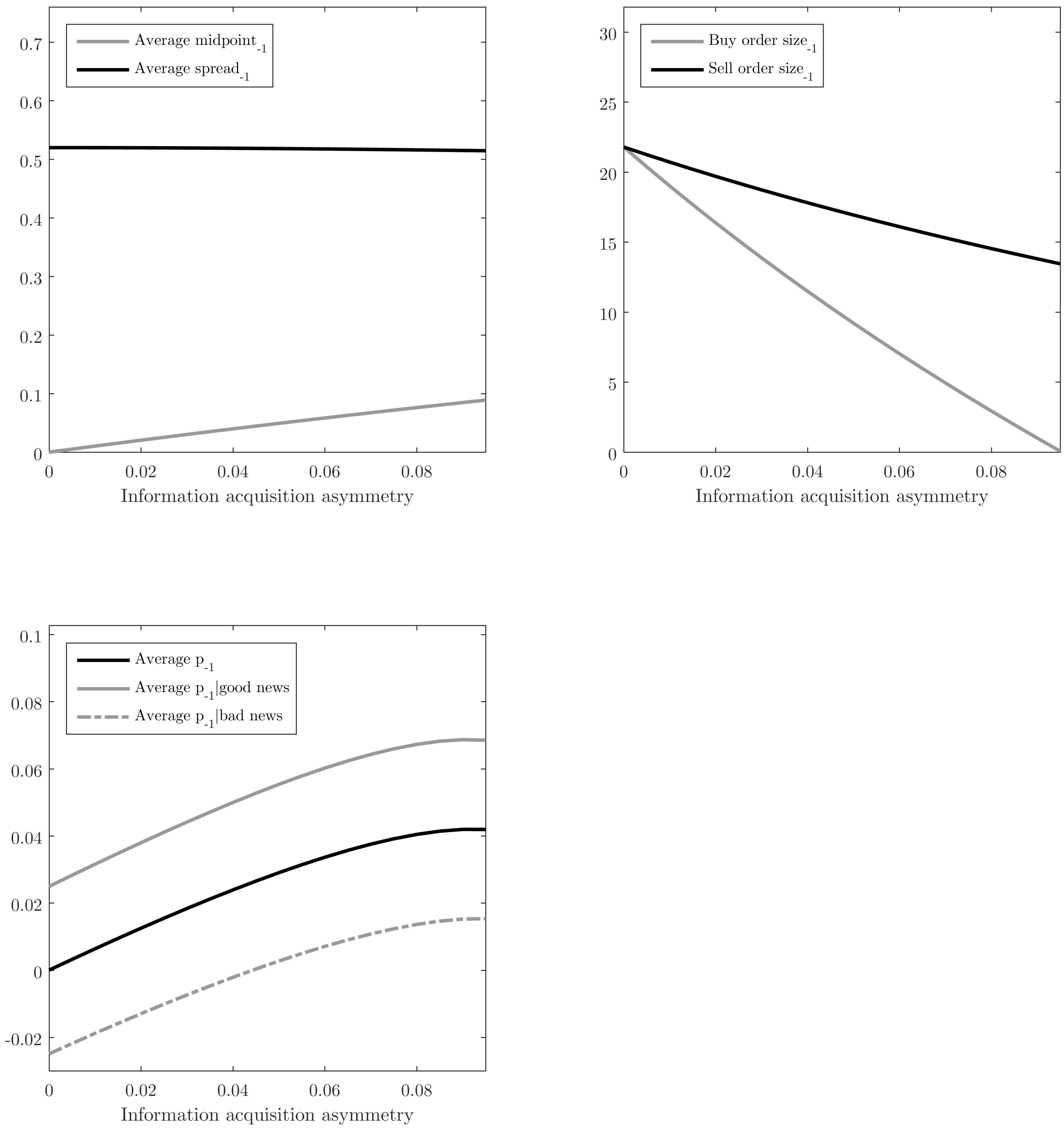

Figure 5: Cumulative Return Across High and Low Uncertainty Firms

This figure plots the average cumulative difference in returns and 95% confidence interval across high and low uncertainty firms in the 21 trading days surrounding the announcement date, t. Firms are assigned to high versus low uncertainty quintiles based on IU, where IU is a composite uncertainty proxy calculated as the sum of volatility (VLTY, earnings volatility (EVOL), and minus 1 times firm age (AGE), where all three measures are standardized each quarter to have a zero mean and unit standard deviation. The sample for this analysis consists of 215,754 quarterly earnings announcements spanning 1993 through 2012.

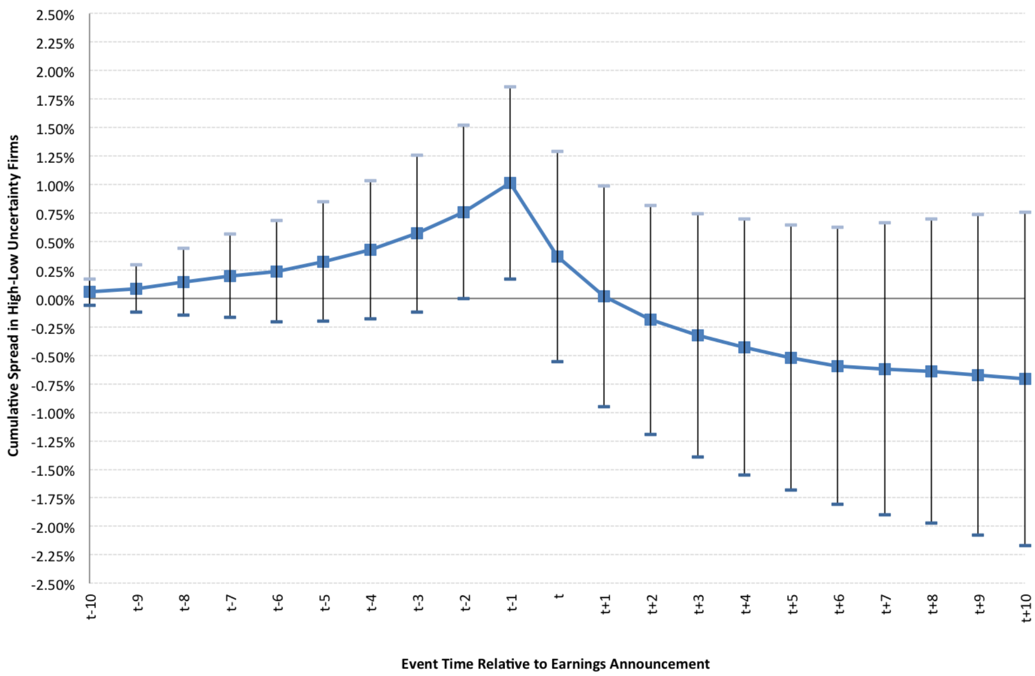

Figure 6: Comparative Statics in our Model

This figure plots comparative statics for our model. The three pages illustrate how the equilibrium changes as we vary three exogenous parameters: ρ, the intermediary's preference for positive positions; γ_M, the risk aversion of the intermediary; and σ^2, the variance of the news accompanying the earnings announcement. For each model parameter, we show how changes affect the equilibrium initial inventory choice Q_{-2}, target Q_{-1}, equilibrium quote midpoints and spreads at $t=-1$, buy and sell order sizes traders use at $t=-1$, average prices at $t=-1$, and average prices at $t-1$ conditional on the sign of earnings news. Midpoints and average prices at $t=-1$ are an average across possible $t=-2$ order flows, and measured relative to the fundamental value $\tilde{v}_{-1}$. We use parameters $p=0.65$, $\rho=0.1$, $\gamma_m=0.02$, $\gamma_t=0.01$, and $\sigma^2=3$, and vary each parameter within a range that results in non-zero quantities for both buy and sell orders regardless of the $t=-2$ order flow.

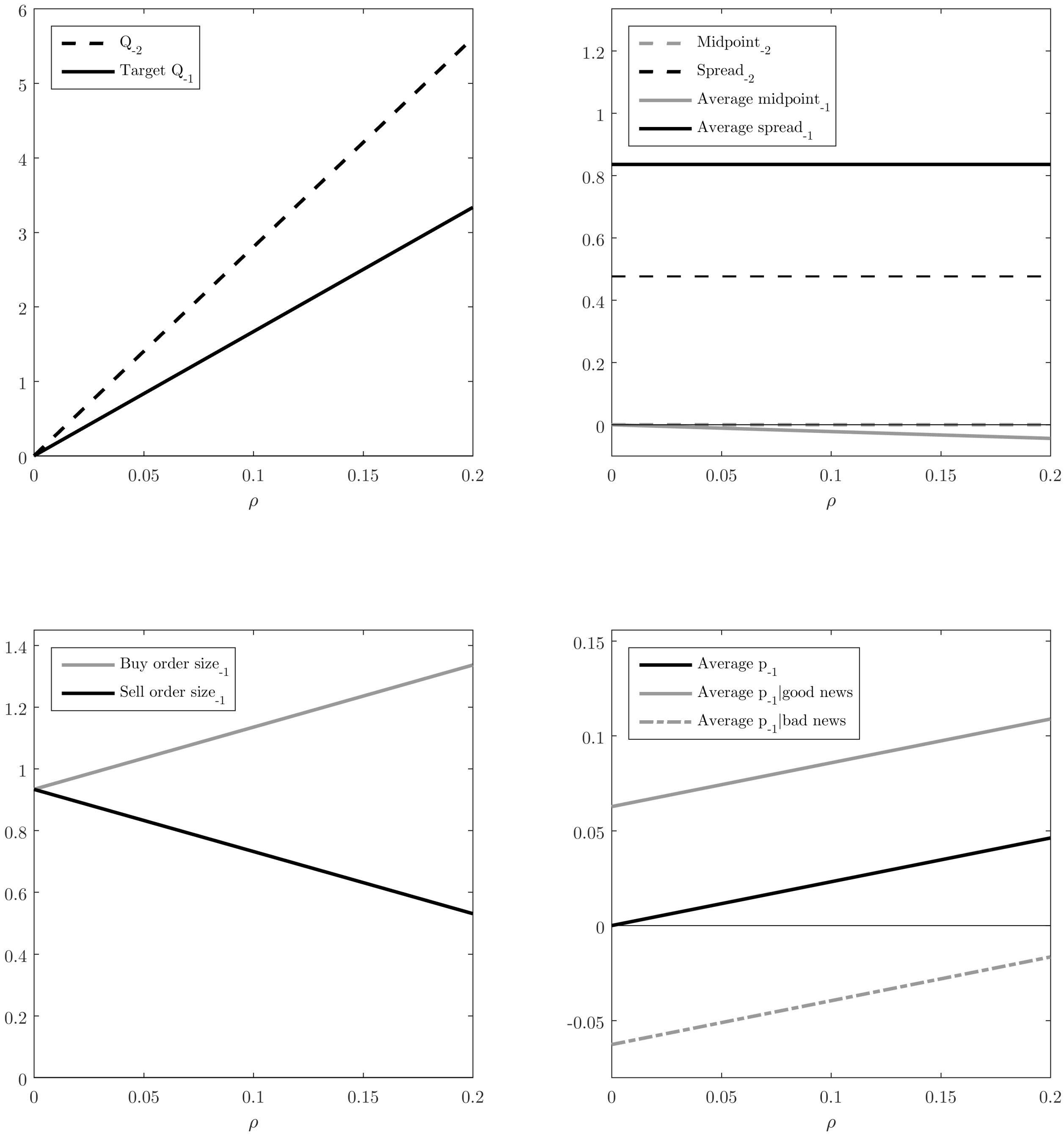

Figure 6: Comparative Statics in our Model (continued)

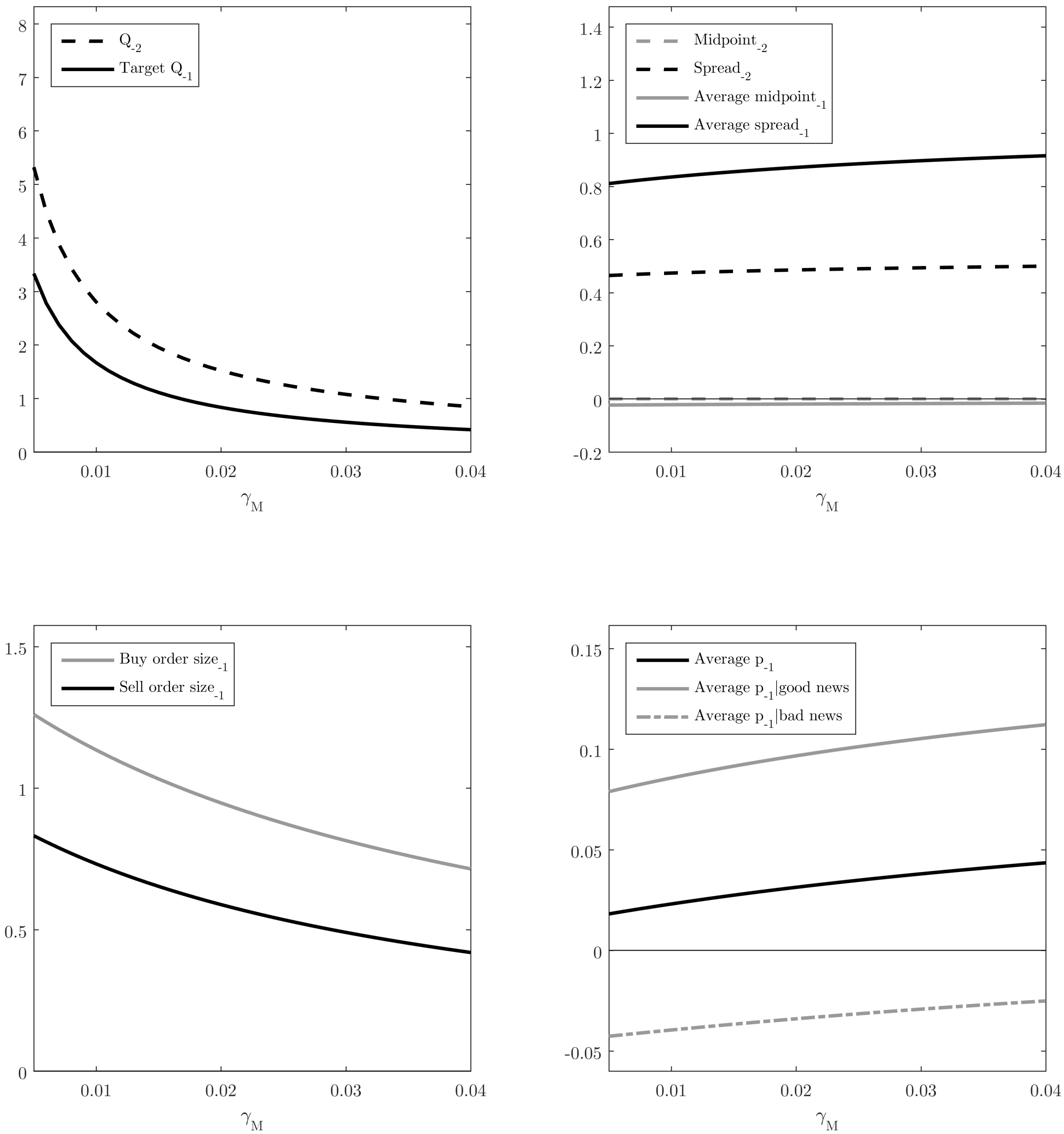

Figure 6: Comparative Statics in our Model (continued)

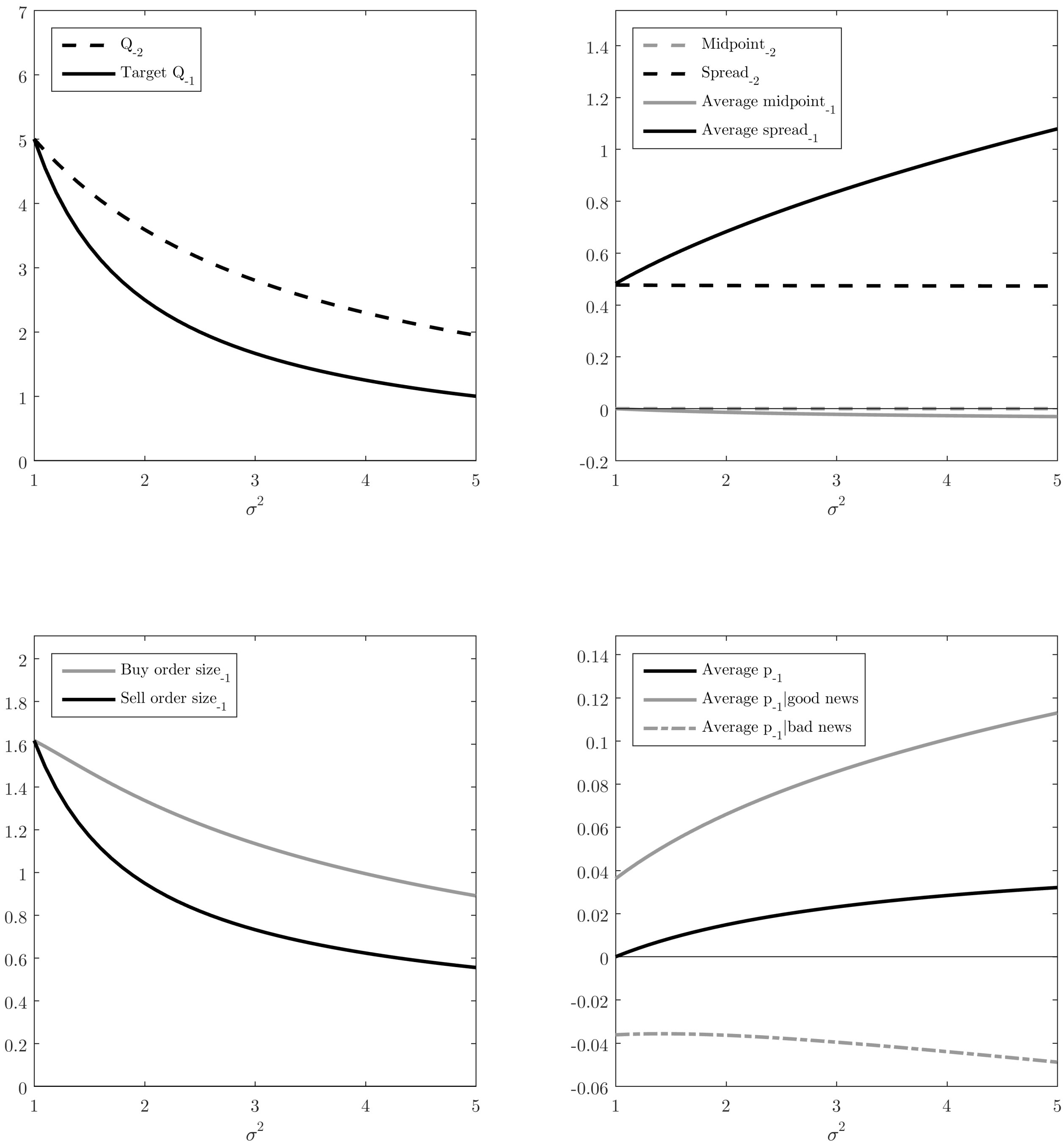

Table 1: Pairwise Regressions of Standardized Average ALP, AOI, and RET

This table presents standardized pairwise regressions in for Average ALP, AOI, and RET across event-time around firm's quarterly earnings announcement dates t. ALP is defined as the difference in reversal patterns across firms within the lowest quintile of returns over the prior day ("losers") and firms within the highest quintile of returns over the prior day ("winners"), constructed as the difference between returns earned from buying prior day losers and returns earned from selling prior day winners. AOI is abnormal order imbalances. Order imbalances equals the difference between buyer- and seller-initiated trading volume, calculated from intraday trade and quote data using the Lee-Ready algorithm. We calculate a firm's daily AOI by standardizing the order imbalance using the mean and standard deviation of the firm's order imbalances from t-51 to t-11. RET equals the daily market-adjusted return. For each day in event time, we average each variable across firms with each calendar quarter, and compute the time-series average across quarters. We standardize each series of event-time averages to make them comparable, and then do pairwise regressions of one standardized variable on another. Each regression has 21 observations, one for each day in event-time from t-10 to t+10.

	Independent variable:		
	ALP	AOI	RET
ALP	-	0.457**	0.863***
	-	(2.295)	(7.653)
AOI	0.457**	-	0.779***
	(2.295)	-	(5.563)
RET	0.863***	0.779***	-
	(7.653)	(5.563)	-

Table 2: Firm-Specific Pre-Announcement ALP, AOI, and Returns

This table contains firm-specific estimates of pre-announcement returns (RET), abnormal order imbalances (AOI), and asymmetric liquidity provision (ALP). Our sample consists of 3,937 firms with at least 20 earnings announcements during our sample window. We estimate RET and AOI by averaging over all observations for a given firm. We estimate ALP for each firm i on event-day s using the coefficients $b_{i,s}$ and $c_{i,s}$ from the following regression:

$$r_{i,q,s+1} = a_{i,s} + b_{i,s} r_{i,q,s} \mathbf{1}(r_{i,q,s} > 0) + c_{i,s} r_{i,q,s} \mathbf{1}(r_{i,q,s} < 0) + \epsilon_{i,q,s+1}, \tag{2}$$

where $r_{i,q,s}$ is the return for firm i in quarter q on day $t+s$ in event-time around the earnings announcement date t. We estimate this regression for all firms in our sample with at least 20 earnings announcements in our main sample by stacking all observations for a given firm from t-4 to t-2. The requirement of at least 20 announcements results in a sample of 3,937 firms. Because greater reversals result in more-negative coefficients, we estimate the asymmetry in liquidity provision as $c_{i,s} - b_{i,s}$ multiplied by -1 so that larger values indicate greater reversals following selling pressure compared to buying pressure. In Panel A, we report firm-specific averages. In Panel B, we report the cross-sectional Spearman correlations and corresponding p-values for each firm-specific estimate.

Panel A: Average Firm-Specific Estimates

	RET(-4,-2)	AOI(-4,-2)	ALP
Mean	0.217	0.004	0.066
t-statistic	(13.74)	(2.22)	(11.46)

Panel B: Correlations of Firm-Specific Estimates

	RET(-4,-2)	AOI(-4,-2)	ALP
RET(-4,-2)		0.226	0.225
		(0.00)	(0.00)
AOI(-4,-2)	0.226		0.032
	(0.00)		(0.05)
ALP	0.225	0.032	
	(0.00)	(0.05)	

Table 3: Directional Trading in Options Markets

This table presents regressions of abnormal pre-announcement implied volatility spreads on the earnings surprise and additional controls. The implied volatility spread is measured from *t*-4 to *t*-2, where *t* is the firm's earnings announcement date, as the difference in implied volatility across standardized at-the-money call and put options of the same strike price and expiration date. To calculate the abnormal implied volatility spread, we standardize it using the mean and standard deviation for the firm from *t*-11 to *t*-51. SURP equals the actual EPS number reported in IBES minus the last consensus forecast available immediately prior to the announcement, and scaled by beginning-of-quarter price. RET(-2,-4) is the market-adjusted return from *t*-4 to *t*-2. LBM and SIZE are the log of one plus the book-to-market ratio and log of market capitalization, respectively. MOMEN equals the firm's market-adjusted return from *t*-51 to *t*-11. The second and third columns present analogous tests when partitioning the sample across good versus bad announcements. An announcement is 'good' ('bad') news when the firm's reported earnings are equal to or exceed (less than) the the last consensus forecast reported in IBES immediately prior to the announcement. All independent variables are assigned to quintiles each calendar quarter where the highest (lowest) values are assigned a value of 1 (0) using the sample's distributional breakpoints from the prior calendar quarter. Year fixed effects are included throughout. ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. The sample for this analysis consists of 108,894 earnings announcements with pre-announcement option data spanning 1996 through 2012.

Panel A: IV Spread Regressions			
	All	Good News	Bad News
	(1)	(2)	(2)
SURPRISE	0.028***	0.028**	0.037**
	(2.95)	(2.37)	(2.10)
RET(-2,-4)	-0.265***	-0.257***	-0.290***
	(-26.54)	(-24.86)	(-15.82)
SIZE	-0.021**	-0.020*	-0.030
	(-2.19)	(-1.69)	(-1.65)
LBM	-0.036***	-0.046***	-0.001
	(-3.78)	(-3.82)	(-0.08)
MOMEN	0.039***	0.042***	0.026**
	(5.60)	(5.54)	(2.05)
R^2	1.181	1.145	1.295
Obs	107,270	76,736	30,534

Table 4: Regulation SHO Tests

Panel A presents results from regressing pre-announcement returns, RET(-4,-2), on an indicator variable that equals one for treatment firms during the SEC experiment known as Regulation SHO. Treatment firms were those whose stock was temporarily exempt from the bid-test and uptick rule regarding short-sales. See Diether, Lee, and Werner (2009) for more details on the implementation of Regulation SHO and its effects. The sample for this analysis consists of 22,012 earnings announcements spanning 2005 through 2007.

Panel A: Reg SHO Treatment

	(1)	(2)	(3)
Treatment	-0.71	-0.008	-0.010
	(-0.028)	(-0.16)	(-0.20)
SIZE	–	0.191***	0.173***
	–	(3.72)	(3.40)
LBM	–	-0.295***	-0.251***
	–	(-5.09)	(-4.47)
MOMEN	–	-0.005	-0.031
	–	(-0.07)	(-0.48)
SURPRISE	–	–	0.286***
	–	–	(4.03)
R^2	0.000	0.002	0.005

Panel B: Asymmetric Liquidity Provision

	ALP(-4,-2)	ALP(-31,-11)	ΔALP
Treatment	0.038	0.054	-0.016
	(0.43)	(1.18)	-(0.17)
Control	0.072	0.012	0.060
	(1.52)	(0.27)	(1.24)

Table 5: Testing for Adverse Selection

This table contains results from regression a proxy for information asymmetry among traders, denoted MIA, on abnormal order imbalances, which are both averaged over t-4 to t-2, where t is the firm's earnings announcement date. Order imbalances equals the difference between buyer- and seller-initiated trading volume, calculated from intraday trade and quote data using the Lee-Ready algorithm. We calculate a firm's daily abnormal order imbalances by standardizing the order imbalance using the mean and standard deviation of the firm's order imbalances from t-51 to t-11. AOI(-4,-2) is the average of abnormal order imbalances from t-4 to t-2. MIA is an estimate of the fraction of market participants that receive a private signal regarding a firm's future dividends that we calculate for each firm-day following Johnson and So (2016a) from observed trading volumes in the firm's options and stock. Columns (1) and (2) rely on levels of MIA, and columns (3) and (4) rely on abnormal MIA by standardizing the measure using the mean and standard deviation of the firm from t-51 to t-11. RET(-4,-2) is the pre-announcement market-adjusted return from t-4 to t-2 in percentage terms. LBM and SIZE are the log of one plus the book-to-market ratio and log of market capitalization, respectively. MOMEN equals the firm's market-adjusted return from t-51 to t-11. All independent variables are assigned to quintiles each calendar quarter where the highest (lowest) values are assigned a value of 1 (0) using distributional breakpoints from the prior calendar quarter. t-statistics, shown in parentheses, are based on two-way cluster robust standard errors, clustered by firm and industry. Year fixed effects are included throughout. ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. The sample for this analysis consists of 39,388 quarterly earnings announcements spanning 1993 through 2012.

	MIA (Levels)		MIA (Abnormal)	
	(1)	(2)	(3)	(4)
AOI(-4,-2)	0.000	0.000	0.002	0.004
	(0.13)	(0.13)	(0.25)	(0.36)
RET(-4,-2)	–	-0.003	–	-0.008
	–	(-0.77)	–	(-0.72)
SIZE	–	-0.039***	–	-0.020
	–	(-3.36)	–	(-0.80)
LBM	–	0.011	–	-0.040**
	–	(1.19)	–	(-2.59)
MOMEN	–	0.013***	–	0.001
	–	(4.57)	–	(0.06)
R^2(%)	0.000	0.839	0.000	0.032

Table 6: Expected Announcement Dates

Panel A presents pre-announcement returns, denoted RET(-2,-4), and abnormal order imbalances, denoted AOI(-4,-2), regressed on a dummy variable indicating that the expected announcement date was publicly verified by the firm at least five trading days before the actual announcement. Panel B presents levels of, and changes in, asymmetric liquidity provision prior to earnings announcement dates for verified versus non-verified announcements. Verified earnings announcement dates are obtained from Wall Street Horizon. The sample for this analysis consists of 76,771 earnings announcements spanning 2006 through 2014.

Panel A: Verified Announcement Dates

	RET(-2,-4)		AOI(-2,-4)	
	(1)	(2)	(3)	(4)
Verified	0.104**	0.092*	0.014**	0.014**
	(2.06)	(1.84)	(2.31)	(2.32)
SIZE	-0.009	-0.014	-0.005***	-0.005***
	(-0.70)	(-1.11)	(-3.18)	(-3.16)
LBM	0.145*	0.219***	0.011	0.010
	(1.88)	(2.79)	(1.29)	(1.17)
MOMEN	-0.004**	-0.004**	-0.000	-0.000
	(-2.11)	(-2.30)	(-1.24)	(-1.23)
SURPRISE	–	0.053***	–	-0.000
	–	(3.53)	–	(-0.49)
INT	0.014	0.068	0.055**	0.055**
	(0.07)	(0.36)	(2.39)	(2.38)
R^2	0.000	0.001	0.000	0.000

Panel B: Asymmetric Liquidity Provision

	ALP(-4,-2)	ALP(-31,-11)	ΔALP
Verified	0.188	0.086	0.102
	(2.04)	(1.42)	(1.36)
Non-Verified	0.069	0.106	-0.037
	(0.81)	(1.98)	-(0.53)
Difference	–	–	0.138
			(2.60)

Table 7: Examining 8-Ks

This table contains average pre-announcement returns (RET), abnormal order imbalances (AOI), and asymmetric liquidity provision (ALP) prior to firms' 8-K filing dates. Each of these variables are constructed using the same approach we use for our main earnings announcement tests. We exclude all 8-Ks filed within 10 days of firms' quarterly earnings announcements, resulting in a sample of 161,051 observations from 1993 to 2012. We report t-statistics, based on the time-series of average values, in parentheses. RET and ALP are expressed as percentages.

Panel A: Returns and AOI for 8-K Filings

	AOI(-2,-4)	RET(-2,-4)
Mean	-0.011	0.067
t-statistic	-(1.84)	(1.85)

Panel B: Asymmetric Liquidity Provision for 8-K Filings

	ALP(t-4,t-2)	ALP(-31,-11)	ΔALP
Mean	-0.008	0.175	-0.183
t-statistic	-(0.15)	(5.27)	-(3.41)

Table 8: Changes in Broker-Dealer Leverage

This table presents average asymmetry in liquidity provision (ALP) and returns surrounding earnings announcements across calendar quarters partitioned by changes in broker-dealer leverage, LevFac. LevFac is defined as the seasonally adjusted log change in the level of broker-dealer leverage from Adrian, Etula, and Muir (2014). Calendar quarters are ranked into quartiles within each calendar year, where the highest (lowest) quartile of LevFac corresponds to quarters with the greatest increase (decrease) in broker-dealer leverage within a given year. ALP is defined as the difference in reversal patterns across firms within the lowest quintile of returns over the prior day ("losers") and firms within the highest quintile of returns over the prior day ("winners"), constructed as the difference between returns earned from buying prior day losers and returns earned from selling prior day winners. *t*-statistics are based on the time-series of quarterly returns. ALP(X,Y) is defined as the average value of ALP over days t+X to t+Y, where t is the earnings announcement date. ΔALP is defined as the difference between ALP(-4,-2) and ALP(-31,-11). To measure abnormal turnover, ΔTO, we subtract the average level of turnover in non-announcement periods from t-51 to t-11. RET(t+X,t+Y) is the cumulative market-adjusted return from t+X to t+Y, where t is the firm's earnings announcement date. The sample for this analysis consists of 178,558 earnings announcements spanning 1993 through 2009. Returns and ALP are shown as percentages.

Panel A: ALP Sorted by Changes in Broker-Dealer Leverage

	ALP(-4,-2)		ALP(-31,-11)		ΔALP	
	Mean	t-stat	Mean	t-stat	Mean	t-stat
1 (Low LevFac)	0.710	4.289	0.123	1.241	0.587	3.763
2	0.400	4.548	0.190	2.133	0.209	2.261
3	0.530	3.832	0.168	2.356	0.362	3.015
4 (High LevFac)	0.207	3.064	0.015	0.246	0.192	2.220

Panel B: Returns Sorted by Changes in Broker-Dealer Leverage

	RET(-4,-2)		RET(-1,+1)		RET(+2,+4)	
	Mean	t-stat	Mean	t-stat	Mean	t-stat
1 (Low LevFac)	0.482	3.190	0.584	3.683	0.159	1.470
2	0.207	2.617	0.062	0.852	-0.064	-0.968
3	0.211	2.162	0.200	1.468	-0.082	-0.790
4 (High LevFac)	0.068	1.278	-0.012	-0.177	-0.139	-1.280

Table 9: Alternative Measures of Pre-Announcement Transaction Costs

This table contains results from regressing abnormal transaction cost measures on abnormal order imbalances, which are both averaged over *t*-4 to *t*-2, where *t* is the firm's earnings announcement date. Order imbalances equals the difference between buyer- and seller-initiated trading volume, calculated from intraday trade and quote data using the Lee-Ready algorithm. We calculate a firm's daily abnormal order imbalances by standardizing the order imbalance using the mean and standard deviation of the firm's order imbalances from *t*-51 to *t*-11. AOI(-4,-2) is the average of abnormal order imbalances from *t*-4 to *t*-2. The three transaction cost measures we employ are (1) Amihud Illiquidity Ratio, defined as the ratio of absolute return to dollar volume, (2) Effective spreads, calculated from intraday TAQ data as the average absolute distance between a transaction's price and the bid-ask midpoint quote, scaled by the midpoint quote, and (3) Ask depth, also calculated from TAQ as the average ask size of intraday quotes. RET(-4,-2) is the pre-announcement market-adjusted return from *t*-4 to *t*-2 in percentage terms. LBM and SIZE are the log of one plus the book-to-market ratio and log of market capitalization, respectively. MOMEN equals the firm's market-adjusted return from *t*-51 to *t*-11. All independent variables are assigned to quintiles each calendar quarter where the highest (lowest) values are assigned a value of 1 (0) using distributional breakpoints from the prior calendar quarter. *t*-statistics, shown in parentheses, are based on two-way cluster robust standard errors, clustered by firm and industry. Year fixed effects are included throughout. ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. The sample for this analysis consists of 215,754 quarterly earnings announcements spanning 1993 through 2012.

	Amihud Illiquidity		Effective Spread		Ask Depth	
	(1)	(2)	(3)	(4)	(5)	(6)
AOI(-4,-2)	-0.709***	-0.413**	-0.048***	-0.040***	10.175***	9.411***
	(-3.75)	(-2.23)	(-8.97)	(-8.62)	(33.24)	(24.83)
RET(-4,-2)	–	-1.257***	–	-0.047***	–	4.475***
	–	(-7.93)	–	(-9.63)	–	(6.59)
SIZE	–	8.108***	–	-0.009***	–	-1.372***
	–	(6.67)	–	(-4.36)	–	(-4.12)
LBM	–	-1.969***	–	0.010***	–	-1.983***
	–	(-3.46)	–	(4.17)	–	(-7.15)
MOMEN	–	-2.153***	–	-0.099***	–	11.771***
	–	(-8.43)	–	(-12.81)	–	(15.65)
R^2 (%)	0.016	2.530	0.163	1.073	0.935	2.460

Table 10: Alternative Testing Windows

This table presents three results from our revised paper using an alternative pre-announcement window from t-6 to t-2 instead of t-4 to t-2. Panel A replicates Panel B of Table 1 in the revised paper. Panel B replicates Table 2 in the revised paper. Panel C replicates Panel A of Table 7, presenting only the High-Low differences rather than all five quintiles.

Panel A: Descriptive Statistics of Asymmetric Liquidity Provision by Year

		ALP(-6,-2)		ALP(-31,-11)		ΔALP	
Year	OBS	Mean	t-stat	Mean	t-stat	Mean	t-stat
1993	6,774	0.404	3.121	0.187	5.427	0.218	1.025
1994	8,026	0.374	4.212	0.143	3.429	0.231	1.970
1995	8,942	0.288	3.512	0.103	2.315	0.185	1.578
1996	9,726	0.461	3.263	-0.038	-0.856	0.499	4.243
1997	10,973	0.364	2.112	0.033	0.941	0.332	1.168
1998	11,212	0.821	4.583	-0.041	-1.029	0.861	2.803
1999	11,361	0.932	5.606	0.287	5.891	0.645	2.205
2000	10,765	0.957	4.501	0.097	1.228	0.860	2.611
2001	10,061	0.894	3.374	0.304	3.226	0.590	1.141
2002	9,894	0.340	2.207	0.131	2.729	0.210	0.730
2003	10,147	0.694	5.818	0.328	9.118	0.366	2.387
2004	10,799	0.160	2.786	0.158	4.970	0.002	0.033
2005	11,450	0.207	5.679	0.012	0.440	0.195	2.105
2006	11,953	0.171	2.333	0.153	5.046	0.017	0.140
2007	12,326	0.043	0.389	0.004	0.203	0.039	0.369
2008	12,246	0.092	0.676	-0.194	-4.191	0.286	2.711
2009	11,903	0.643	2.274	0.442	5.906	0.201	0.572
2010	12,472	0.343	4.170	0.224	6.632	0.119	0.881
2011	12,303	0.085	0.655	0.045	1.439	0.040	0.182
2012	12,421	-0.054	-0.766	0.045	1.178	-0.098	-1.282
All	215,754	0.411	7.200	0.121	3.413	0.290	5.345

Panel B: Alternative Proxies for Asymmetric Liquidity Provision

	Amihud Illiquidity		Effective Spread		Ask Depth	
	(1)	(2)	(3)	(4)	(5)	(6)
AOI(-6,-2)	-1.004***	-0.697***	-0.053***	-0.043***	9.544***	8.435***
	(-6.12)	(-4.09)	(-10.89)	(-10.28)	(24.62)	(17.61)
RET(-6,-2)	–	-1.522***	–	-0.063***	–	6.455***
	–	(-8.58)	–	(-13.41)	–	(11.74)
SIZE	–	6.122***	–	-0.026***	–	-1.195***
	–	(4.85)	–	(-7.90)	–	(-4.02)
LBM	–	-1.649**	–	0.012***	–	-1.951***
	–	(-2.47)	–	(3.85)	–	(-7.09)
MOMEN	–	-2.375***	–	-0.103***	–	12.784***
	–	(-7.84)	–	(-10.61)	–	(15.30)
R^2 (%)	0.019	0.928	0.156	1.071	0.868	2.901

Panel C: Asymmetric Liquidity Provision

	High			Low		
	ALP(-6,-2)	ALP(-31,-11)	ΔALP	ALP(-6,-2)	ALP(-31,-11)	ΔALP
EVOL	0.639	0.189	0.450	0.119	0.116	0.003
	(6.83)	(3.25)	(5.03)	(2.16)	(3.50)	(0.05)
VLTY	0.708	0.237	0.470	0.026	0.030	-0.004
	(5.77)	(3.19)	(3.80)	(0.72)	(1.31)	-(0.08)
AGE	0.218	0.069	0.149	0.623	0.112	0.511
	(4.67)	(2.45)	(3.49)	(6.68)	(2.06)	(4.94)

Table 11: Comparison of Value-Weighted Results

Panel A presents time-series average returns prior to and during firms' quarterly earnings announcements, where t denotes the announcement date. RET(t+X,t+Y) equals the market-adjusted return from X to Y days relative to the announcement date t. We calculate the value-weighted average return within each calendar quarter and report the time-series average across quarters along with t-statistics based on the time-series of quarterly average returns. Panel B presents analogous tests corresponding to asymmetric liquidity provision, ALP, where ALP on day t+X is the difference between returns earned from buying prior day losers and earned from selling prior day winners, where losers and winners are based on cross-sectional quintile cutoffs from the prior calendar quarter of returns on day t+X−1. Returns and ALP are shown as percentages. For each variable and event-time window, we compute the time-series average for a sample consisting of 34,377 earnings announcements spanning 1983 through 1992, as well as for a sample consisting of 215,754 quarterly earnings announcements spanning 1993 through 2012.

Panel A: Value-Weighted Returns

	RET(t-4,t-2)	RET(t-1,t+1)	Ratio
1983-1992	0.145	0.028	5.247
	(2.07)	(0.35)	
1993-2012	0.133	0.168	0.793
	(3.69)	(3.48)	

Panel B: Value-Weighted ALP

	ALP(t-4,t-2)	ALP(-31,-11)	ΔALP
1983-1992	0.263	0.070	0.192
	(3.29)	(2.15)	(2.18)
1993-2012	0.215	0.138	0.077
	(5.07)	(5.80)	(1.79)