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Disagreement Resolution Horizon and Open Market Repurchase Program Completion

Ali Choubdaran Varnosfaderani*

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Abstract

This paper examines the puzzling heterogeneity in completion rates of open market repurchase programs, where some announcing firms execute zero repurchases while some complete their programs rapidly. I propose the disagreement resolution horizon hypothesis (DRHH), which argues that completion rates reflect managers' expectations about when their disagreement with the market will naturally resolve. Using hand-collected data from SEC filings (2004-2022), I document three key findings. First, low-completion firms significantly outperform analyst expectations in years one and two post-announcement, while high-completion firms excel in years three and four. Second, this pattern is reflected in market reactions, with significant positive returns around earnings announcements occurring in corresponding periods. Third, while all announcing firms earn significant long-run abnormal returns, the timing of return realization systematically varies with completion rates. These results suggest that managers strategically balance duration-dependent costs of undervaluation against immediate costs of share repurchases, with their completion decisions signaling the expected timeline of information asymmetry resolution. The findings extend traditional signaling theories by highlighting how the temporal dimension of information asymmetry influences corporate payout policy.

a.choubdaran-varnosfaderani@lse.ac.uk

1 Introduction

The past four decades have witnessed a substantial increase in both the frequency and volume of open-market share repurchases (Grullon and Michaely, 2004; Kooli and L'Her, 2010). While these programs have become increasingly popular, firms show remarkable heterogeneity in their commitment to completion. Recent evidence reveals that 14% of announcing firms execute zero repurchases in the year following authorization, while some achieve nearly complete execution over the same period. This variation is particularly intriguing because while program announcements are relatively costless and flexible, actual share repurchases require significant resource allocation, potentially diverting funds from operations and investments. The costly nature of program execution suggests that completion decisions may contain valuable information about managers' private information and intentions. Understanding what drives this substantial heterogeneity in completion rates, and what these differences signal, is therefore crucial for interpreting both announcement and execution decisions in open market repurchase programs.

The traditional view of repurchase announcements emphasizes their role as signals of undervaluation. Survey evidence from Brav et al. (2005) confirms that managers primarily initiate these programs when they perceive their stock as undervalued. Markets generally respond positively to such announcements (Vermaelen, 1981; Bartov, 1991; Comment and Jarrell, 1991), but this reaction appears incomplete. Several studies document favorable long-term returns following repurchase announcements (Ikenberry et al., 1995, 2000; Akhigbe et al., 2007), suggesting that the market only partially incorporates the signal's information content.

This partial market response creates a second decision point for announcing firms. Given that undervaluation likely persists after the announcement, managers must choose whether to execute costly share repurchases as a further signal. This decision is particularly important because undervaluation can have substantial real effects on firms. Edmans et al. (2012) show that undervalued firms face increased acquisition risk, while Baker et al. (2003) and Hau and Lai (2013) document that such firms exhibit reduced investment

and employment levels. Given the costs associated with undervaluation and the flexible, non-binding nature of open market repurchase programs, managers may rationally choose to announce these programs as a low-cost signal of undervaluation. However, when this initial signal is only partially incorporated by the market and undervaluation persists, managers must then carefully weigh the costs of continued undervaluation against the more substantial costs of sending further signals through actual share repurchases.

Existing explanations for completion rate heterogeneity focus primarily on differences in the degree of undervaluation, but they offer contradictory predictions. Chan et al. (2010) suggest that low-completion firms are not actually undervalued but announce programs to mislead investors, implying these firms should underperform post-announcement. Conversely, Bhattacharya and E. Jacobsen (2016) argue that low-completion firms are more undervalued and can achieve price correction through announcement alone, predicting strong initial performance but no sustained outperformance. Neither explanation, however, can fully account for the patterns I document in this paper.

This paper proposes and tests a novel explanation: the "disagreement resolution horizon hypothesis" (DRHH). Rather than focusing on the magnitude of undervaluation, the DRHH emphasizes the expected timeline over which manager-market disagreements about firm value will naturally resolve. The key insight is that managers face a trade-off between two costs: the accumulating costs of continued undervaluation and the immediate costs of share repurchases. Crucially, the optimal balance in this trade-off depends on how quickly managers expect their superior information to become apparent to the market through natural channels such as earnings announcements and operational developments.

The DRHH predicts systematic differences in the timing of performance realization based on completion rates. Managers expecting near-term resolution of disagreements may rationally choose lower completion rates, knowing their superior performance will soon become apparent. In contrast, managers anticipating longer-horizon resolution may find it optimal to incur the immediate costs of share repurchases to signal their conviction, as the cumulative costs of extended undervaluation would otherwise be substantial.

These divergent strategies should generate distinct patterns in firm performance relative to market expectations. When compared to analyst estimates made at the time of announcement, the DRHH clearly predicts that low-completion firms will deliver positive surprises in the near term, while high-completion firms will outperform over longer horizons. However, the pattern relative to continuously updated market expectations depends crucially on how well the market interprets firms' completion decisions. If the information content of completion strategies, particularly the intensive buybacks by high-completion firms, is only partially incorporated by the market, we should observe similar temporal patterns in performance relative to contemporaneous analyst estimates and market reactions, albeit with smaller magnitudes. This partial incorporation would also be reflected in the timing of long-run abnormal returns, as the market gradually recognizes the information conveyed by firms' completion decisions.

To test these predictions, I construct a comprehensive dataset of repurchase programs and their completions from 2004 to 2022 using SEC Forms 10-Q and 10-K. This dataset offers significant advantages over traditional Compustat-based measures, which Banyi et al. (2008) show can deviate from actual repurchases by more than 30% in many cases. My hand-collected data allows for precise tracking of program completion rates and enables clean identification of the relationship between completion decisions and subsequent performance patterns. The empirical analysis proceeds in three stages. First, I examine how completion rates predict the timing of superior operating performance. Categorizing firms into quartiles based on three-month completion rates, I find that low-completion firms are significantly more likely to exceed analyst estimates for both net income and revenue in years one and two post-announcement, while high-completion firms show superior performance in years three and four. Second, analysis of abnormal returns around earnings announcements reveals that these performance patterns genuinely surprise the market: low-completion firms experience significant positive price reactions in early years, while high-completion firms see stronger reactions in later years. Finally, examination of long-run stock returns shows that while all announcing firms earn significant abnormal returns over a four-year horizon, the timing of these returns systematically varies with completion rates in a manner consistent with the DRHH.

These findings cannot be explained by existing theories of completion heterogeneity. The superior early performance of low-completion firms contradicts both the notion that they announce to mislead investors and the idea that their undervaluation is fully incorporated at announcement. Instead, the evidence suggests that completion rates serve as signals about the horizon of information asymmetry resolution, with managers strategically choosing completion levels based on their expectations about when disagreements will naturally resolve.

This study makes several important contributions to our understanding of corporate payout policy and information asymmetry. First, it introduces and empirically validates the disagreement resolution horizon hypothesis (DRHH), demonstrating that completion rates reflect managers' expectations about the timeline of information asymmetry resolution rather than merely the degree of undervaluation. Second, it provides novel evidence that managers strategically balance the temporal distribution of costs - weighing the duration-dependent costs of undervaluation against the immediate costs of share repurchases. Third, it shows how completion rates can serve as valuable signals to market participants, not only about the existence of undervaluation but also about its expected resolution horizon. Finally, by highlighting the importance of temporal dynamics in information asymmetry, this paper extends traditional signaling theories that have primarily focused on the magnitude rather than the duration of information gaps between managers and markets.

2 Data

2.1 *Quarterly repurchase and Repurchase announcements*

New disclosure requirements in the US mandate the publication of monthly share repurchases under Item 2(e) of Form 10-Q and Item 5(c) of Form 10-K. This requirement applies to all periods ending on or after March 15, 2004. Under these rules, firms must report the total number of shares purchased, the average price paid per share, the number of shares purchased under repurchase programs, and either the maximum dollar amount or the maximum number of shares that could still be purchased under these programs.

To gather data on actual repurchases, I utilized the Center for Research in Security Prices (CRSP) to identify all common shares (share codes 10 and 11) traded on the NYSE, Amex, and Nasdaq (exchange codes 1, 2, and 3) between January 2004 and December 2022. I excluded firms for which I could not locate accounting data on COMPUSTAT, analyst data on IBES, or mutual fund ownership information on the CDA/Spectrum mutual fund database. For the remaining firms, I employed a computer script to download and extract repurchase data from all 10-Q and 10-K filings within the specified period. Due to non-adherence to the proposed disclosure format by many firms, I manually reviewed and corrected such entries. This process led to the identification of 12,441 repurchase programs. Further refinement excluded programs that were not open market, lacked a stated authorization date, or did not specify a fixed size. After applying these filters, the final dataset comprised 11,278 programs and 104,268 firm-quarters with an active program.

Next, I compared the quarterly repurchase figures in my dataset with those reported on Compustat. Compustat provides only the total number of shares repurchased and the average price paid per share, and does not detail the number of shares purchased under publicly announced programs or the remaining amount under those programs. Therefore, I aligned the total number of shares repurchased in my dataset with the corresponding figure on Compustat. Notably, 95% of the repurchase figures in my dataset are within a 5% variance of their Compustat counterparts. This minor discrepancy generally arises because Compustat reports its figures in millions of shares and applies rounding.

For the remaining 5% of cases, where the difference exceeds 5%, I observed two predominant discrepancies: either Compustat reports zero repurchase while my dataset shows a nonzero figure, or the figures differ by three orders of magnitude. I randomly verified 20% of such cases and found that almost invariably, the data in my dataset is accurate. The common error stems from Compustat's misinterpretation of the unit in which the figure is reported. For example, if a company reports its quarterly repurchase as 1,200 thousand shares, Compustat might extract this as merely 1,200 shares and

erroneously round it to zero. In instances where the unit has been incorrectly extracted but the figure has not been rounded to zero, a three-order magnitude difference typically emerges between my figures and those reported by Compustat.

This comparison underscores a significant concern regarding the quality of Compustat's quarterly repurchase data. While only five percent of Compustat figures significantly deviate from the correct numbers, the magnitude of such errors is noteworthy. Typically, Compustat figures are smaller by orders of magnitude, which exacerbates this issue. If the errors had resulted in figures that were orders of magnitude larger, they would likely be detected as outliers (since the quarterly repurchase as a percentage of shares outstanding would be abnormally high) and easily excluded. However, erroneous Compustat figures tend to result in very small quarterly repurchases, which may not be flagged and excluded, potentially skewing analyses based on this data.

Erroneous figures are not the only reason for caution regarding the Compustat repurchase dataset. As previously mentioned, Compustat reports only the total number of shares repurchased, which differs significantly from the total number of shares purchased under publicly announced programs. This distinction is crucial because the total number of shares purchased encompasses various transactions, including: Shares returned to the issuer for tax payments on vested restricted stock units, Shares surrendered by employees and directors for tax liabilities and stock option exercises, and Repurchase of unvested restricted stock units from employees whose employment terminated before their shares vested. In these scenarios, it is the employee, not the company, who decides on the repurchase of shares, aligning more closely with insider selling than purchasing. Conversely, in a formal repurchase program, the company makes the purchasing decision and acquires shares at market prices. However, in transactions involving employees, the acquisition price may deviate from the current market price.

While the total shares repurchased is an improvement over the older measure of purchase of common stock, it is still problematic in certain applications. For example, consider applications similar to Leng and Noronha (2013), Bhattacharya and E. Jacobsen

(2016), and Yook (2010). In these papers, announcing firms are divided into two groups of repurchasers and non-repurchasers based on whether or not they have repurchased a single share following the announcement. The total number of shares purchased under publicly announced programs (not available on COMPUSTAT) is the right measure for such applications. Using total shares repurchased misidentifies 19% of non-repurchasers as repurchasers in the first quarter following the announcement in my dataset. This example demonstrates that even total shares repurchased is still a problematic measure in certain applications and emphasizes the importance of data collection from SEC 10-Q and 10-K forms.

Another key feature of my dataset is that it provides quarterly figures for the remaining amount under publicly announced repurchase programs. Through extensive text analysis, I have linked the details of the repurchase programs with the stated remaining figures. Consequently, I can define the completion level at each point in time as the ratio of the difference between the initial program size and the current remaining balance to the initial program size. Table 1 presents summary statistics of the completion levels in the months following the initiation of the repurchase program. Specifically, the mean completion levels are 14.04%, 41.46%, 50.84%, and 57.01% three months, one year, two years, and three years after the program's initiation, respectively.

Table 2 presents a comparative analysis of firm characteristics across different completion level quartiles. Firms are assigned to each quartile based on their completion level three months after the announcement. Firms in the highest completion quartile (quartile four) display some distinctive features compared to those in the lowest quartile (quartile one). Notably, high-completion firms are covered by substantially more analysts, indicating greater market visibility. They also maintain lower leverage ratios, suggesting a lower likelihood of financial distress. Additionally, these firms tend to be slightly larger in size.

2.2 *Other Data*

Stock return and trading information are obtained from the CRSP daily stock file. The dataset includes only common stocks traded on the NYSE, NASDAQ, or AMEX from January 2004 to December 2022. To address potential microstructure issues, all stocks priced below five dollars per share are excluded from the analysis. Accounting data and financial ratios are sourced from quarterly COMPUSTAT files. Analysts' estimates are derived from the Institutional Brokers' Estimate System (IBES) database. Quarterly mutual fund ownership data is obtained from the CDA/Spectrum mutual fund database.

3 Empirical Results

3.1 *Repurchase announcement and unexpected performance*

This section examines the relative performance of announcing firms compared to analysts' estimates in the four years following a repurchase announcement. The focus is on quarterly net income and revenue for two primary reasons. First, these measures are the most widely covered by analysts and are readily available in the IBES database. Second, they are not influenced by changes in the number of shares outstanding, which repurchases directly affect, thus impacting per-share figures such as EPS.

For each firm-quarter, I define a dummy variable *beat* equal to one if the firm's net income (or revenue) exceeds the mean analysts' estimate in that quarter, and zero otherwise. Next, I match each announcing firm with a similar non-announcing firm based on industry and the number of analysts covering the firm. Specifically, for each announcing firm, I select a non-announcing firm with the same 2-digit SIC code and the closest number of analyst coverage in the quarter prior to the announcement. If multiple firms meet these criteria, I select the one with the closest book-to-market ratio to the announcing firm. The matching procedure is based on values from the quarter preceding the repurchase announcement[1].

[1]To validate this matching procedure, I compare the mean and median of size decile, mutual fund ownership decile, book-to-market ratio, leverage ratio, and cash ratio between matched firms and

Subsequently, I pool four quarters within a year and estimate the following probit regression for each year (year 1 to year 4) after the announcement:

$$beat_{i,t} = a_y + b_y * treat_i + \sum_{k=1}^{n} b_{y,k} * Control_{i,k} + \epsilon_{i,t} \tag{1}$$

where i represents the firm, t represents the quarter, and y represents the year following the announcement (1 to 4). Year one comprises the first four quarters following the announcement quarter, with subsequent years defined similarly. $beat_{i,t}$ is the dummy variable defined earlier, and $treat_i$ is another dummy variable that takes the value of one if firm i is the announcing firm and zero if it is the matched firm. I include an array of control variables in the regression: mutual fund ownership decile (own), size decile ($size$), number of analysts ($analysts$), book-to-market ratio (bm), leverage ratio ($leverage$), return on assets (roa), and cash ratio ($cash$). The leverage ratio is defined as total liabilities to total book value of assets, return on assets as operating income before depreciation as a fraction of average total assets, and cash ratio as cash balance as a fraction of total liabilities. All control variables are calculated using values from the quarter prior to the announcement.

Tables 3 and 4 report the results of this regression for net income and revenue, respectively. Focusing first on Table 3, the coefficient of the $treat$ variable is positive and, except for the first year, statistically significant. These coefficients represent economically significant effects, with marginal effects of 1.6%, 3.7%, 6.4%, and 4.5% for years one through four, respectively. For instance, a marginal effect of 6.4% for year 3 implies that announcing firms are 6.4 percentage points more likely to deliver net income above the average analyst estimate in quarters of year 3 compared to their matched firms.

The signs of other coefficients in Table 3 provide additional insights. For example, own has a consistently positive and mostly significant coefficient across all columns,

announcing firms. Even at a 10% significance level, there are no significant differences between these two groups.

potentially suggesting that mutual funds have superior ability in predicting future firm prospects relative to the average analyst. Variables *roa*, *size*, and *bm* also show significant and consistent patterns across years, indicating that firms with lower book-to-market ratios, higher returns on assets, and larger sizes are more likely to deliver better-than-expected net income.

Table 4, which focuses on revenue performance, shows a pattern similar to Table 3. The coefficient of the *treat* variable is positive for all years and statistically significant except for year one. These coefficients indicate that announcing firms are more likely to beat mean analysts' revenue estimates in the years following the announcement compared to their matched firms. The results in Table 4 not only provide further robustness but are of particular importance as future revenue is less affected by managerial actions following the announcement compared to future net income.

Grullon and Michaely (2004) argue that the announcement of a repurchase program indicates a firm's transition to a more mature state. As mature firms face lower growth opportunities, they often focus more on efficiency and profit margin improvement. If analysts underestimate the effects of such a mechanism, it may explain the superior net income reports in future quarters. Therefore, while it is a nuanced distinction, one cannot interpret the results of Table 3 as managers having superior information regarding future net income at the time of the announcement, as their unanticipated actions following the announcement may have resulted in better-than-expected future net income. However, the higher likelihood of better-than-expected revenue delivery reported in Table 4 is less affected by this argument and is more likely to reflect disagreement between managers and analysts regarding future prospects at the time of the announcement.

Research on whether announcing firms experience improvement in operating performance following the announcement of open market repurchase programs has not converged to a unified conclusion. Grullon and Michaely (2004) find that announcements of open-market share repurchase programs are not followed by an increase in operating performance, while Lie (2005) documents that operating performance improves following

such announcements. These conflicting findings are particularly perplexing considering that both papers use quite similar samples of announcements. My methodology in Tables 3 and 4 differs from those used in previous papers focusing on operating performance improvement, making direct comparisons challenging. However, a comparison between these methodologies and their respective advantages and limitations can be informative.

The common strategy used in prior papers focusing on operating performance improvement is to calculate the difference in operating performance in subsequent years relative to the firm's performance at the time of announcement, adjusted by the change over the same interval in matched firms to offset any expected change. In contrast, I rely on the common consensus of analysts to define surprising subsequent performance and use matched firms to address constant biases and time trend dynamics in analyst consensus. This approach offers several advantages:

1. Since prior papers rely fully on the matching firm method to offset any expected changes, their results are highly sensitive to the choice of matching firms. Lie (2005) argues that using a different matching strategy is one reason his results differ from prior papers.

2. Even if matching-firm adjusted change in operating performance correctly captures surprising performance change with regard to the information available at the time of announcement, it does not provide insights about the evolution of information asymmetry following the announcement over time. In other words, after a repurchase is announced and the market at least partially incorporates this information, it is unclear whether actual performance delivered in subsequent quarters continues to surprise the market at the time those performance measures are reported.

3. My method allows for the study of relative quarterly performance of the firm with respect to the current consensus in that quarter, thus capturing the dynamics of surprising performance. This feature is especially useful in understanding the nature of long-run stock performance following stock repurchases. Consistent with the persistent

undervaluation documented in prior studies, Tables 3 and 4 reveal that firm performance is also being underestimated persistently.

3.2 *Completion and unexpected performance*

Having established that announcing firms generally outperform analyst expectations, I now examine how this outperformance varies with program completion rates. DRHH predicts that firms with different completion rates should exhibit different temporal patterns in their outperformance. To test this prediction, I divide announcing firms into quartiles based on their completion rates three months after the announcement and estimate equation (1) separately for each quartile. As in the previous section, the dependent variable is a dummy equal to one if the firm's quarterly performance exceeds the mean analyst estimate.

Tables 5 and 6 reveal striking differences in the timing of outperformance between firms with low and high completion rates. Firms in the bottom quartile of completion (quartile 1) are significantly more likely to exceed analyst estimates for both net income and revenue in the first two years following the announcement, but show no significant outperformance in years three and four. In contrast, firms in the top quartile of completion (quartile 4) display the opposite pattern: they show no significant outperformance in the first two years but are significantly more likely to exceed analyst estimates in years three and four. This temporal pattern in outperformance strongly supports the disagreement resolution horizon hypothesis.

The intuition behind these findings aligns with the theoretical framework. When managers perceive their stock as undervalued, they initiate repurchase programs to signal this perception to the market. However, as documented earlier, these signals are often only partially incorporated, leaving some degree of undervaluation to persist. Managers then face a choice: they can either engage in costly share repurchases to further signal their conviction, or they can allow time and future performance to resolve the disagreement naturally. The optimal choice depends crucially on how quickly managers expect the disagreement to resolve.

For firms where managers expect disagreement to resolve in the near term through upcoming developments or performance revelations, the costs of actual share repurchases may outweigh the short-term costs of continued undervaluation. These firms, which appear in our lowest completion quartile, indeed deliver superior performance in the near term (years one and two), validating management's initial position. Conversely, when managers anticipate that disagreement will persist over a longer horizon, the cumulative costs of extended undervaluation may exceed the costs of share repurchases. These firms, appearing in our highest completion quartile, execute substantial repurchases and subsequently deliver superior performance in later years (years three and four).

While Tables 5 and 6 demonstrate clear temporal patterns in performance relative to contemporaneous analyst estimates, they don't directly establish whether these patterns were anticipated at the time of the repurchase announcement. To address this question, I examine performance relative to analyst estimates made at the announcement time. However, this analysis presents two challenges. First, analysts rarely provide quarterly estimates beyond the immediate future, especially for years three and four. Second, estimates for more distant periods are typically provided only for fiscal year-end results, creating potential timing misalignment with repurchase announcements.

To handle these challenges while maintaining the integrity of the analysis, I focus on programs announced within one month of the firm's fiscal year-end. For example, if a firm's fiscal year ends in December, I include only programs announced in November, December, or January. This restriction ensures that the timing of analyst estimates aligns consistently with post-announcement periods across all firms in the sample. While this approach reduces the sample size, it provides cleaner identification of the relationship between completion rates and expected performance at the announcement time.

Tables 7 and 8 present results from probit regressions similar to those in Tables 5 and 6, but using fiscal year performance against announcement-time analyst estimates. Since the patterns are similar for both net income and revenue, I focus the discussion on net income results in Table 7. The results reveal an important nuance in how analyst

expectations evolve over time. Firms in the lowest completion quartile show a higher likelihood of exceeding announcement-time estimates across all four years, contrasting with Table 5 where they outperform contemporaneous estimates only in years one and two. This difference suggests that after observing strong performance in the first two years, analysts adjust their expectations upward for years three and four, explaining why these firms no longer surprise relative to contemporaneous estimates in later years.

For firms in the highest completion quartile, the pattern of outperformance relative to announcement-time estimates mirrors that seen with contemporaneous estimates: significant outperformance in years three and four but not in years one and two. This consistency suggests that analysts maintain their relatively pessimistic views of these firms' prospects even after the announcement, leading to continued positive surprises in later years.

These findings provide strong support for the disagreement resolution horizon hypothesis. They suggest that at the time of the announcement, managers of all undervalued firms possess favorable information about future performance that is not fully appreciated by the market. However, the timing of when this superior performance will materialize - and thus resolve the disagreement - appears to drive their completion decisions. Firms expecting near-term resolution limit their share repurchases, knowing their superior performance will soon become apparent. In contrast, firms anticipating longer-horizon resolution engage in substantial repurchases to signal their conviction, as their superior performance will take longer to materialize and validate their position.

While the analysis of analyst estimates suggests that firms with the lowest completion rates deliver positive surprising performance over the first two years after the announcement, and firms with the highest completion rates deliver positive surprising performance over years 3 and 4 relative to analyst expectations, one might question whether these results truly represent market surprises, given that analysts are known to be relatively slow in adjusting their estimates.

To validate that these performance surprises genuinely impact market expectations, I examine stock price reactions around earnings announcements.Specifically, I calculate cumulative abnormal returns over a four-day window [day -1, day +2] around quarterly earnings announcement dates. Abnormal returns are computed using a one-factor model with the value-weighted index as the market proxy, estimated over the period from 250 to 10 days prior to each announcement.

The results, reported in Table 9, strongly reinforce the patterns observed in our analysis of analyst estimates. Firms in the bottom completion quartile experience significant positive abnormal returns around earnings announcements in years one and two, with no significant price reactions in years three and four. Conversely, firms in the top completion quartile show significant positive price reactions in years three and four.

Our findings can be compared to those of Lie (2005), who categorizes announcing firms into three groups based on Compustat data: non-repurchasers (firms that did not repurchase during the announcement quarter), repurchasers (firms that repurchased shares exceeding 1% of market value of equity during the announcement quarter), and others. Focusing on repurchasers and non-repurchasers, Lie calculates cumulative abnormal returns around earnings announcements over eight subsequent quarters following the repurchase announcement. These eight quarters correspond to years one and two in our Table 9, with his non-repurchase group roughly corresponding to our bottom quartile. Notably, the mean cumulative abnormal returns we document for the bottom quartile in years one and two are larger in magnitude and more statistically significant than those reported by Lie (2005). While he finds positive abnormal returns for non-repurchasers across all eight quarters, these returns are generally not significant at the 5% level.

This difference in results likely stems from the distinct sample periods examined. Lie's study covers 1981-2000, while our analysis spans 2004-2022, beginning after the implementation of new SEC disclosure mandates. This timing distinction is crucial, as Bonaimé (2015) documents significant changes in firms' repurchase behavior following these new mandates. Specifically, in the enhanced disclosure environment, firms announce

fewer and slightly smaller open market repurchase plans. Moreover, Bonaime shows that completion rates significantly increased following the new mandates, consistent with a decline in false signaling. These changes in corporate behavior suggest that in our sample, fewer firms announce repurchase programs to mislead investors, and therefore, low completion is less likely to indicate false signaling compared to Lie (2005) sample period.

3.3 *Completion and Long Run Stock Price Performance*

A well-documented phenomenon in the literature is the long-run abnormal stock price performance of firms following repurchase announcements. Ikenberry et al. (1995), examining announcements between 1980 and 1990, document average abnormal buy-and-hold returns of 12.1% over the four years following announcements. They attribute this performance to market underreaction to repurchase announcements, a pattern also observed in self-tender offers (Lakonishok and Vermaelen, 1990). More recently, Peyer and Vermaelen (2009) confirm the persistence of this abnormal performance in contemporary data.

Building on these findings, I leverage my dataset's ability to track program completion rates to examine whether the timing of long-run abnormal returns varies with completion rates. Given our earlier evidence of systematic differences in the timing of performance surprises across completion quartiles, one might suspect that the timing of long-run abnormal returns also varies with completion rates. To examine year-by-year performance patterns, I follow the methodology of Grullon and Michaely (2004) and Leng and Noronha (2013), estimating Carhart four-factor regression models at daily frequency for each announcing firm over each post-announcement year. The regression intercepts (alphas) provide measures of daily abnormal returns.

Table 10 presents mean and median alphas for each completion quartile over each of the four post-announcement years, as well as over the entire four-year window. The results reveal two key patterns. First, significant long-run abnormal performance exists across all completion quartiles, confirming that the documented post-announcement drift

is a broader phenomenon not limited to specific completion levels. Second, and more importantly, the timing of abnormal returns varies systematically with completion rates in a manner consistent with our earlier findings.

Firms in the bottom two completion quartiles realize the majority of their abnormal returns in years one and two, with statistically significant and economically large daily alphas in these years but insignificant returns in years three and four. In contrast, firms in the top two completion quartiles show their strongest performance in years three and four, where the bulk of their abnormal returns occurs. Importantly, while these high-completion firms realize most of their abnormal performance in later years, they do achieve positive returns in years one and two, with some statistical significance. The presence of these early returns, while modest compared to their later performance, suggests that the market partially incorporates the signal conveyed by their intensive share repurchases. This pattern of modest early returns, followed by stronger and more significant performance in later years, indicates that high-completion firms' costly signaling efforts through actual share repurchases do help reduce undervaluation, albeit gradually.

These patterns in long-run returns provide independent confirmation of our earlier findings and further support the disagreement resolution horizon hypothesis. The timing of abnormal returns aligns precisely with when firms in different completion quartiles deliver superior operating performance, suggesting that completion rates indeed signal the horizon over which manager-market disagreements will resolve. Moreover, these findings suggest that completion rates could be used to enhance traditional post-announcement investment strategies. While prior research documents significant abnormal returns from buying and holding all announcing firms, our results indicate that investors might achieve better timing by conditioning their investments on completion rates. Specifically, a refined strategy might involve immediately investing in firms with low three-month completion rates (holding for years one and two) while delaying investment in high-completion firms until year three (holding through year four). Such an approach would better align investment horizons with the temporal pattern of abnormal returns, potentially improving upon the performance of simpler buy-and-hold strategies.

4 Summary and conclusion

Open market repurchase (OMR) programs have become the dominant form of corporate payout policy over the past four decades. Despite their widespread adoption, a puzzling feature of these programs is the substantial heterogeneity in their completion rates. Using a comprehensive dataset of repurchase programs from 2004 to 2022, I document that over 14% of announcing firms have zero completion one year after authorization, while others complete their programs rapidly. This variation is particularly intriguing because while announcements are relatively costless, actual share repurchases involve significant resource allocation, suggesting that completion decisions may contain valuable information about managers' beliefs and intentions.

Prior literature has attempted to explain this heterogeneity primarily through differences in the degree of undervaluation. One view suggests that low-completion firms are not truly undervalued but announce programs to mislead investors. An alternative perspective argues that these firms are actually more undervalued but can achieve price correction through announcement alone, making actual repurchases unnecessary. However, my empirical findings challenge both explanations. I find that both low and high-completion firms deliver superior performance relative to expectations, but crucially, they do so over different time horizons.

This paper proposes and tests the "disagreement resolution horizon hypothesis" (DRHH) to explain these patterns. The DRHH argues that completion rates reflect managers' expectations about when their disagreement with the market will naturally resolve. Managers who anticipate near-term resolution of disagreement may limit costly share repurchases, knowing their superior performance will soon become apparent. Conversely, managers expecting longer-horizon resolution may find it optimal to incur repurchase costs to signal their conviction, as the costs of extended undervaluation would otherwise be substantial.

Three distinct empirical analyses strongly support this hypothesis. First, firms

in the lowest completion quartile significantly outperform analyst expectations in years one and two post-announcement, while high-completion firms show superior performance in years three and four. Second, this pattern is reflected in market reactions, with low-completion firms experiencing significant positive returns around earnings announcements in early years and high-completion firms in later years. Finally, analysis of long-run stock returns reveals that while all announcing firms earn significant abnormal returns over the four-year post-announcement period, the timing of these returns systematically varies with completion rates in a manner consistent with the DRHH.

These findings have important implications for corporate finance theory and practice. First, they suggest that the information content of repurchase programs extends beyond the simple announcement effect, with completion rates providing valuable signals about the horizon of information asymmetry resolution. Second, they highlight how managers strategically balance the costs of undervaluation against the costs of actual repurchases, with the expected duration of disagreement playing a crucial role. Third, they suggest potential improvements to post-announcement investment strategies, as completion rates might help predict the timing of abnormal returns.

More broadly, this paper contributes to our understanding of corporate signaling mechanisms by highlighting the importance of temporal dynamics in information asymmetry resolution. While previous research has focused primarily on the degree of information asymmetry, these findings suggest that the expected duration of such asymmetry can significantly influence both corporate decisions and market outcomes. Future research might explore whether similar temporal considerations affect other corporate decisions where managers possess superior information about future prospects.

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5 Tables

Table 1: Summary Statistics for Repurchase Program Completion Rates

This table reports summary statistics for completion rates of open market repurchase programs at various intervals following program authorization. The sample consists of all open market repurchase programs announced between 2004 and 2022 by firms listed on NYSE, NASDAQ, and AMEX. Completion rates are calculated using data from SEC Forms 10-Q and 10-K, where completion rate is defined as the difference between the initial program size and the remaining authorization balance, divided by the initial program size, expressed as a percentage. For each time horizon (3, 12, 24, and 36 months after authorization), the table presents the mean, median, and various percentiles of completion rates across all programs active during that period. A completion rate of zero indicates no shares were repurchased during the period, while a rate of 100 would indicate full program completion.

	Mean	Median	10%	25%	75%	90%
3 Months After Authorization	14.04	12.11	0.00	2.65	20.86	26.97
12 Months After Authorization	41.46	39.53	0.00	15.34	62.65	76.32
24 Months After Authorization	50.84	48.59	12.91	33.24	72.96	87.49
36 Months After Authorization	57.01	55.76	14.61	39.91	78.61	91.27

Table 2: Firm Characteristics by Repurchase Program Completion Quartiles

This table presents firm characteristics across quartiles of repurchase program completion rates for open market repurchase programs announced between 2004 and 2022. Firms are sorted into quartiles based on their program completion rate three months after the announcement, where completion rate is defined as the difference between the initial program size and the remaining authorization balance, divided by the initial program size. Quartile 1 represents the lowest completion rates and Quartile 4 the highest. For each characteristic, the table reports the mean (top row) and median (in parentheses). Size decile is constructed by sorting all NYSE, NASDAQ, and AMEX common stocks based on market capitalization in the quarter prior to announcement. Fund Ownership decile is similarly constructed based on the percentage of shares owned by mutual funds in the prior quarter. Number of Analysts is the number of analysts covering the firm in the quarter prior to announcement. Book-to-Market ratio is the ratio of book value of equity to market value of equity. Leverage ratio is total liabilities divided by total book value of assets. Cash ratio is cash balance as a fraction of total liabilities. All characteristics are measured in the quarter prior to the repurchase announcement.

Characteristic	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Book-to-Market	0.563	0.532	0.535	0.578
	(0.513)	(0.443)	(0.431)	(0.505)
Size Decile	6.433	7.112	7.275	7.066
	(7.000)	(8.000)	(8.000)	(7.000)
Fund Ownership Decile	6.735	6.870	7.040	6.787
	(7.000)	(7.000)	(8.000)	(7.000)
Number of Analysts	9.648	12.157	12.793	12.114
	(7.000)	(10.000)	(11.000)	(11.000)
Leverage ratio	0.197	0.182	0.172	0.167
	(0.158)	(0.152)	(0.142)	(0.120)
Cash ratio	0.585	0.593	0.599	0.604
	(0.185)	(0.197)	(0.207)	(0.189)

Table 3: Probit Regression Results: Yearly Analysis of Net Income Performance

This table reports probit regression results examining whether firms announcing open market repurchase programs between 2004 and 2022 are more likely to exceed analyst net income estimates in subsequent years. The dependent variable beat equals one if quarterly net income exceeds the mean analyst estimate. The key independent variable treat equals one for announcing firms and zero for matched firms, where matching is based on 2-digit SIC code and analyst coverage. Control variables, measured in the quarter before announcement, include: mutual fund ownership decile (own), size decile (size), number of analysts (analysts), book-to-market ratio (bm), leverage ratio (total liabilities/assets), return on assets (operating income before depreciation/average assets), and cash ratio (cash/total liabilities). Years 1-4 represent consecutive 12-month periods after the announcement quarter. Z-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%.

	Dependent Variable: *beat*			
Variable	Year 1	Year 2	Year 3	Year 4
treat	0.0446	0.1036***	0.1828***	0.1292***
	(1.355)	(2.965)	(4.894)	(3.200)
own	0.0172**	0.0098	0.0203**	0.0203**
	(2.462)	(1.314)	(2.566)	(2.389)
size	0.0224***	0.0218***	0.0119	0.0140*
	(3.126)	(2.904)	(1.492)	(1.654)
analysts	0.0112***	0.0100***	0.0087**	0.0082**
	(3.502)	(3.035)	(2.522)	(2.302)
bm	-0.1053**	-0.0046	-0.1134**	-0.2672***
	(-2.048)	(-0.087)	(-2.006)	(-4.032)
leverage	-0.0074	-0.0716	0.0887	0.1362
	(-0.086)	(-0.791)	(0.896)	(1.263)
roa	0.4130***	0.4934***	0.2881***	0.4541***
	(5.210)	(5.760)	(3.226)	(4.062)
cash	-0.0069**	-0.0023	-0.0057*	-0.0072
	(-2.272)	(-0.803)	(-1.800)	(-1.154)
Constant	0.1612**	0.1708**	0.2058***	0.2459***
	(2.479)	(2.517)	(2.838)	(3.036)
Observations	63,278	61414	56353	51184
Pseudo R^2	1.21	1.32	1.39	1.79

Table 4: Probit Regression Results: Yearly Analysis of Revenue Performance

This table reports probit regression results examining whether firms announcing open market repurchase programs between 2004 and 2022 are more likely to exceed analyst revenue estimates in subsequent years. The dependent variable beat equals one if quarterly revenue exceeds the mean analyst estimate. The key independent variable treat equals one for announcing firms and zero for matched firms, where matching is based on 2-digit SIC code and analyst coverage. Control variables, measured in the quarter before announcement, include: mutual fund ownership decile (own), size decile (size), number of analysts (analysts), book-to-market ratio (bm), leverage ratio (total liabilities/assets), return on assets (operating income before depreciation/average assets), and cash ratio (cash/total liabilities). Years 1-4 represent consecutive 12-month periods after the announcement quarter. Z-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%.

	Dependent Variable: *beat*			
Variable	Year 1	Year 2	Year 3	Year 4
treat	0.0390	0.0733**	0.1062***	0.0841***
	(1.134)	(2.450)	(3.587)	(2.863)
own	0.0106	0.0200***	0.0254***	0.0069
	(1.609)	(2.865)	(3.385)	(0.872)
size	0.0080	-0.0068	0.0058	0.0018
	(1.186)	(-0.968)	(0.773)	(0.220)
analysts	0.0048	0.0051	0.0037	0.0017
	(1.584)	(1.640)	(1.122)	(0.500)
bm	-0.1774***	-0.2134***	-0.1852***	-0.3017***
	(-3.686)	(-4.294)	(-3.493)	(-4.656)
leverage	-0.0670	-0.0319	0.0805	-0.0308
	(-0.824)	(-0.371)	(0.869)	(-0.304)
roa	0.1372*	-0.0992	0.0475	-0.0494
	(1.674)	(-1.123)	(0.527)	(-0.470)
cash	0.0071*	-0.0001	-0.0015	-0.0152**
	(1.928)	(-0.037)	(-0.517)	(-2.338)
Constant	0.1613**	0.2536***	0.0850	0.3693***
	(2.553)	(3.901)	(1.231)	(4.749)
Observations	63,278	61414	56353	51184
Pseudo R^2	0.41	0.49	0.63	0.58

Table 5: Probit Regression Results by Completion Quartiles: Net Income Performance

This table examines how the likelihood of beating analyst net income estimates varies with repurchase program completion rates in the four years following announcement. The sample consists of open market repurchase programs announced between 2004 and 2022. Firms are sorted into quartiles based on their program completion rate three months after announcement. For each completion quartile and year, I estimate separate probit regressions where the dependent variable beat equals one if quarterly net income exceeds the contemporaneous mean analyst estimate. The key independent variable treat equals one for announcing firms and zero for matched firms, where matching is based on 2-digit SIC code and analyst coverage. While all regressions include control variables (mutual fund ownership decile, size decile, number of analysts, book-to-market ratio, leverage ratio, return on assets, and cash ratio) and a constant term, I report only the treat coefficient estimates. For each coefficient, I report the z-statistic (in parentheses) and the marginal effect in percentage points [in brackets]. Years 1-4 represent consecutive 12-month periods after the announcement quarter. All control variables are measured in the quarter before announcement. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Variable	Year 1	Year 2	Year 3	Year 4
Quartile 1				
treat	0.1921***	0.1857***	0.0952	-0.0587
	(3.028)	(2.975)	(1.273)	(-0.987)
	[7.05***]	[7.12***]	[3.32]	[-2.10]
Quartile 2				
treat	0.0039	0.0806	0.1187*	0.1221
	(0.102)	(1.481)	(1.713)	(1.482)
	[0.14]	[3.71]	[3.94*]	[4.31]
Quartile 3				
treat	0.0027	0.0782	0.1818**	0.1805**
	(0.051)	(1.407)	(2.344)	(2.265)
	[0.09]	[3.47]	[6.04**]	[6.27**]
Quartile 4				
treat	-0.0312	0.0878	0.2501***	0.2474***
	(-0.483)	(1.593)	(3.740)	(3.120)
	[-1.09]	[3.91]	[8.75***]	[8.63***]

Table 6: Probit Regression Results by Completion Quartiles: Revenue Performance

This table examines how the likelihood of beating analyst revenue estimates varies with repurchase program completion rates in the four years following announcement. The sample consists of open market repurchase programs announced between 2004 and 2022. Firms are sorted into quartiles based on their program completion rate three months after announcement. For each completion quartile and year, I estimate separate probit regressions where the dependent variable beat equals one if quarterly revenue exceeds the contemporaneous mean analyst estimate. The key independent variable treat equals one for announcing firms and zero for matched firms, where matching is based on 2-digit SIC code and analyst coverage. While all regressions include control variables (mutual fund ownership decile, size decile, number of analysts, book-to-market ratio, leverage ratio, return on assets, and cash ratio) and a constant term, I report only the treat coefficient estimates. For each coefficient, I report the z-statistic (in parentheses) and the marginal effect in percentage points [in brackets]. Years 1-4 represent consecutive 12-month periods after the announcement quarter. All control variables are measured in the quarter before announcement. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Variable	Year 1	Year 2	Year 3	Year 4
Quartile 1				
treat	0.1467**	0.1587***	-0.0111	-0.0197
	(2.451)	(2.688)	(-0.326)	(-0.355)
	[5.73**]	[6.82***]	[-1.98]	[-0.75]
Quartile 2				
treat	0.0913	0.0733	0.0266	0.0005
	(1.437)	(0.974)	(0.316)	(0.009)
	[3.49]	[2.84]	[1.04]	[0.025]
Quartile 3				
treat	-0.0177	0.0494	0.1411**	0.1372*
	(-0.316)	(1.155)	(2.099)	(1.822)
	[-0.67]	[2.48]	[5.56**]	[5.18*]
Quartile 4				
treat	-0.0380	0.0873	0.2133***	0.2030***
	(-0.733)	(1.591)	(3.484)	(3.133)
	[-1.46]	[4.86]	[8.22***]	[7.38***]

Table 7: Probit Regression Results by Completion Quartiles: Net Income Performance Against Announcement-Time Estimates

This table examines how the likelihood of beating announcement-time analyst net income estimates varies with repurchase program completion rates. Firms are sorted into quartiles based on their program completion rate three months after announcement. For each completion quartile and year, I estimate separate probit regressions where the dependent variable beat equals one if fiscal year net income exceeds the mean analyst estimate made at the time of repurchase announcement. The key independent variable treat equals one for announcing firms and zero for matched firms, where matching is based on 2-digit SIC code and analyst coverage. While all regressions include control variables (mutual fund ownership decile, size decile, number of analysts, book-to-market ratio, leverage ratio, return on assets, and cash ratio) and a constant term, I report only the treat coefficient estimates. For each coefficient, I report the z-statistic (in parentheses) and the marginal effect in percentage points [in brackets]. Years 1-4 represent consecutive fiscal years after announcement. All control variables are measured in the quarter before announcement. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Variable	Year 1	Year 2	Year 3	Year 4
Quartile 1				
treat	0.2154***	0.2933***	0.2622***	0.2031**
	(3.551)	(4.1850)	(3.1203)	(2.0713)
	[7.89***]	[9.71***]	[8.15***]	[5.63**]
Quartile 2				
treat	0.0053	0.0990	0.1243*	0.1291
	(0.305)	(1.557)	(1.781)	(1.476)
	[0.18]	[4.31]	[4.66*]	[4.59]
Quartile 3				
treat	0.0038	0.0917	0.2122***	0.2546***
	(0.185)	(1.476)	(2.580)	(3.074)
	[0.25]	[3.77]	[6.88***]	[8.81***]
Quartile 4				
treat	-0.0278	0.1237	0.2912***	0.3346***
	(-0.344)	(1.525)	(3.927)	(3.608)
	[-1.04]	[4.91]	[9.87***]	[11.66***]

Table 8: Probit Regression Results by Completion Quartiles: Revenue Performance Against Announcement-Time Estimates

This table examines how the likelihood of beating announcement-time analyst revenue estimates varies with repurchase program completion rates. Firms are sorted into quartiles based on their program completion rate three months after announcement. For each completion quartile and year, I estimate separate probit regressions where the dependent variable beat equals one if fiscal year revenue exceeds the mean analyst estimate made at the time of repurchase announcement. The key independent variable treat equals one for announcing firms and zero for matched firms, where matching is based on 2-digit SIC code and analyst coverage. While all regressions include control variables (mutual fund ownership decile, size decile, number of analysts, book-to-market ratio, leverage ratio, return on assets, and cash ratio) and a constant term, I report only the treat coefficient estimates. For each coefficient, I report the z-statistic (in parentheses) and the marginal effect in percentage points [in brackets]. Years 1-4 represent consecutive fiscal years after announcement. All control variables are measured in the quarter before announcement. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Variable	Year 1	Year 2	Year 3	Year 4
Quartile 1				
treat	0.1648***	0.2134***	0.1714**	0.1342**
	(2.5873)	(3.3295)	(2.5631)	(1.9807)
	[6.33***]	[9.89***]	[8.05**]	[5.82**]
Quartile 2				
treat	0.1094	0.1125*	0.1104	0.1038
	(1.581)	(1.743)	(1.699)	(1.574)
	[4.10]	[4.44*]	[4.38]	[3.95]
Quartile 3				
treat	-0.0088	0.0743	0.1624**	0.1906**
	(-0.107)	(1.498)	(2.274)	(2.486)
	[-0.54]	[2.88]	[6.17**]	[7.25**]
Quartile 4				
treat	-0.0323	0.0998	0.2542***	0.2806***
	(-0.674)	(1.479)	(3.649)	(3.475)
	[-1.33]	[4.12]	[10.85***]	[12.05***]

Table 9: Abnormal Returns Around Earnings Announcements by Completion Quartiles

This table reports mean and median cumulative abnormal returns (CARs) around quarterly earnings announcements for firms sorted by their repurchase program completion rates. Firms are divided into quartiles based on their completion rate three months after the repurchase announcement (Quartile 1: lowest, Quartile 4: highest). CARs are calculated over a four-day window [day -1, day +2] around each earnings announcement, using a one-factor model with the value-weighted market index. The estimation period spans from 250 to 10 days before each announcement. Years 1-4 represent consecutive 12-month periods following the repurchase announcement, with each year containing four quarterly observations. Values are in percentages. P-values from t-tests (for means) and signed rank tests (for medians) are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Mean

	Year 1	Year 2	Year 3	Year 4
Quartile 1	0.6145***	0.6009***	0.2003	-0.2652
	(0.003)	(0.004)	(0.389)	(0.1942)
Quartile 2	0.0916	0.2971	-0.0394	0.0626
	(0.582)	(0.172)	(0.877)	(0.689)
Quartile 3	0.1866	0.2762	0.7102***	0.3998*
	(0.337)	(0.215)	(0.001)	(0.077)
Quartile 4	0.1712	0.3493	0.8903***	0.6703***
	(0.368)	(0.155)	(0.000)	(0.002)

Panel B: Median

	Year 1	Year 2	Year 3	Year 4
Quartile 1	0.5293***	0.5187***	0.1333	-0.0992
	(0.000)	(0.000)	(0.361)	(0.486)
Quartile 2	0.1446	0.3090*	0.0192	0.1183
	(0.213)	(0.085)	(0.765)	(0.462)
Quartile 3	0.1758	0.2351	0.5624***	0.3865*
	(0.357)	(0.199)	(0.000)	(0.087)
Quartile 4	0.1875	0.3356	0.7347***	0.6251***
	(0.279)	(0.1371)	(0.000)	(0.000)

Table 10: Long-Run Abnormal Returns by Completion Quartiles

This table reports daily abnormal returns (alphas) from Carhart four-factor model regressions for firms sorted by repurchase program completion rates. Firms are divided into quartiles based on their completion rate three months after the repurchase announcement (Quartile 1: lowest, Quartile 4: highest). For each firm in each quartile, I estimate separate four-factor regressions for each of the first four years following the announcement, as well as over the entire four-year period. The 4-Year column reports results from regressions estimated over the entire four-year window. Panel A reports mean alphas, with p-values from t-tests in parentheses. Panel B reports median alphas, with p-values from signed rank tests in parentheses. Alphas are in percent per day. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

Panel A: Mean

	Year 1	Year 2	Year 3	Year 4	4-Year
Quartile 1	0.0279***	0.0250***	0.0061	-0.0042	0.0191***
	(0.000)	(0.000)	(0.251)	(0.212)	(0.000)
Quartile 2	0.0177***	0.0157**	0.0032	-0.0027	0.0141***
	(0.008)	(0.017)	(0.686)	(0.690)	(0.001)
Quartile 3	0.0051	0.0101*	0.0193**	0.0142**	0.0138***
	(0.114)	(0.074)	(0.011)	(0.042)	(0.000)
Quartile 4	0.0113**	0.0104*	0.0237***	0.0225***	0.0208***
	(0.026)	(0.068)	(0.000)	(0.000)	(0.000)

Panel B: Median

	Year 1	Year 2	Year 3	Year 4	4-Year
Quartile 1	0.0232***	0.0230***	0.0064	-0.0055	0.0188***
	(0.000)	(0.000)	(0.165)	(0.259)	(0.000)
Quartile 2	0.0138***	0.0128**	0.0060	-0.0011	0.0138***
	(0.007)	(0.012)	(0.281)	(0.722)	(0.000)
Quartile 3	0.0064	0.0086*	0.0220***	0.0165***	0.0166***
	(0.102)	(0.083)	(0.000)	(0.004)	(0.000)
Quartile 4	0.0097**	0.0085*	0.0239***	0.0212***	0.0198***
	(0.012)	(0.062)	(0.000)	(0.000)	(0.000)