# Peer Influence on Dividend Policy

Master's Thesis

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M.Sc. Applied Economics and Finance

Hand-in date: 15th of May 2018

Supervisor: Daniel Streitz

STU count: 234,798 Pages: 116

## Abstract

By analyzing the quarterly structure of dividends, we find some evidence of peer influences on dividend policies. Specifically, several of our results show that firms are more likely to follow the four-quarter structure in dividend increases (four-quarter structure) when peer firms follow it. The term four-quarter structure reflects a growing tendency for firms to increase dividends every fourth quarter. That makes dividends more predictable to the market, and this affects the firms' ability to use dividends as a signaling device (Andres & Hofbaur, 2017). This emphasizes the relevance of the four-quarter structure, and in this thesis, we contribute to the understanding of why firms adopt the four-quarter structure. The decision to follow the four-quarter structure somewhat depends on industry prospects, and all members of a peer group face the same uncertainty around these industry prospects. Therefore, as the firm observes that more and more peers start following the four-quarter structure, this indicates that it would be beneficial for the firm as well. Thus, we hypothesize that the probability that a firm follows the four-quarter structure increases as more peers start following the structure. We use a logit regression model to test this hypothesis. Our baseline results show evidence of significant peer effects, and most of our robustness test further support this result. However, our results are sensitive to controls for unobserved peer group factors. Hence, while we find evidence of peer effects, we cannot rule out that this is driven by common peer group factors. Our study suffers from methodological limitations in terms of peer group definition and controls for common factors, and we encourage future research to address these limitations. Consequently, our hope is that this thesis could inspire future research on peer influences on the decision to adopt the four-quarter structure.

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# 1. Introduction

Payout decisions are among the most important decisions made by the firm, and cash dividends have historically been the primary payout method (Adhikari & Agrawal, 2018). Theory suggests that firms use dividend changes to convey private information to the market, and this idea has inspired a vast amount of research for decades. Most studies find that the market sees information in dividend announcements (Allen & Michaely, 2003), but recent literature finds that this informational content is weakening (Amihud & Li, The Declining Information of Dividend Announcements and the Effect of Institutional Holdings, 2006). Specifically, as the information asymmetry between the firm and the market diminishes, there is less information about the firm's private information in dividend announcements. Andres and Hofbaur (2017) give the most recent explanation for this development. They show that dividends are losing informational content because they are becoming more predictable. This is a result of an increasing tendency among firms to announce dividend increases in the same quarter every year. They define this tendency as the four-quarter[1] reference structure in dividend increases (four-quarter structure). As markets can observe this tendency, it becomes easier to predict when firms will make dividend increases, and this reduces the information asymmetry between the firm and the market.[2]

Andres and Hofbaur (2017) show that firms who increase their dividends annually tend to announce it in the same quarter every year. The firms then maintain dividends at the same level for the subsequent three quarters, before increasing it again exactly four quarters after the latest increase. Major US corporations such as Wal-Mart, IBM and Target have been following the structure for years, and firms generally tend to persistently stick to the four-quarter structure once they have adopted it. In addition, the four-quarter structure has become increasingly prevalent over time, with 30% of firms following it in the 1970s compared to approximately 60% today. The firm-specific motivation to follow the four-quarter structure is not fully understood, but previous research has determined what

[1] In this Master Thesis, we only refer to one structure, which is the four-quarter reference structure in dividend increases. The four-quarter structure and structure refer to the same.

[2] Andres and Hofbaur (2017) show that following the four-quarter structure leads to a significantly lower abnormal return upon dividend increase announcements, and this implies that there is lower informational content in dividends.

characterizes firms that follow it. Such firms are typically high valued, large[3] and have stable earnings (Andres & Hofbaur, 2017).

The findings by Andres and Hofbaur (2017) suggest that the decision to follow the four-quarter structure is made in isolation. However, in other studies of corporate policies, peer firms have a significant impact on firm decision-making (Foucault & Fresard, 2013; Leary & Roberts, 2014; Kaustia & Rantala, 2015), so it is perhaps inconclusive not to account for this. Generally, peer effects occur when a firm reacts to peer firms' behavior by making similar decisions (Manski, 1993). In the decision to follow the four-quarter structure, this would imply that firms partly base their decision to adopt the four-quarter structure on whether peers are following this structure. This idea has not yet been tested, but we deem it plausible that there should be peer effects on firms' decision to adopt the four-quarter structure.

Banerjee (1992) argues that it can be rational to imitate the decisions by peers when the decision is complex. Particularly, when a firm is facing a complex choice, the behavior of peers can give an indication of optimal behavior (Banerjee, 1992). Peers are similar in terms of their products and services, so when the decision depends on industry prospects, firms could use the prior decisions by peers as guidance. In the decision to follow the four-quarter structure, the firm's decision could likely depend on industry prospects. The firm knows that peers that increase dividends face the same choice on whether to adopt the four-quarter structure, and that their choices likewise depend on industry prospects. Hence, when observing that peers are following the four-quarter structure, the firm can infer that this is beneficial. This effect should strengthen when more peers adopt the four-quarter structure, as there is even more indication that the decision is beneficial. Consequently, this inspires the research purpose of this paper. *This thesis attempts to identify whether there is evidence of peer effects on firms' decision to adopt the four-quarter structure in dividend increases, by analyzing whether recent adoptions by peers increase the probability that the firm adopts the four-quarter structure.*

When testing whether there is evidence of peer effects, we contribute to Andres and Hofbaur's (2017) findings on what drives the probability of four-quarter adoption. Before building onto

[3] In terms of market capitalization.

that analysis, we attempt to verify the findings by Andres and Hofbaur (2017). Firstly, the motivation behind studying the four-quarter structure is that it reduces the informational content of dividends. Therefore, to motivate further analysis on the topic, we analyze whether we find a similar impact of the four-quarter structure. Secondly, our specific contribution to the literature is to expand the knowledge on why firms adopt the four-quarter structure. The previously established knowledge in this field is that certain firm characteristics affect the probability of adoption, such as size and earnings stability (Andres & Hofbaur, 2017). To ensure that we build onto what Andres and Hofbaur (2017) find, we analyze whether we see the same impact of these firm characteristics on the probability of adopting the four-quarter structure. Thirdly, the four-quarter structure is associated with more dividend smoothing, in the sense that firms who follow the four-quarter structure seem to smooth dividends more (Andres & Hofbaur, 2017). We therefore analyze whether the same is evident from our data. In addition, to our best knowledge, we are the first to provide support for the findings by Andres and Hofbaur (2017). Our analysis therefore contributes to the literature by providing support for their results. In doing so, we address some potential methodology shortcomings of Andres and Hofbaur (2017), which serves as further robustness tests of their findings.

In terms of verifying previous findings, our thesis provides support for the findings by Andres and Hofbaur (2017). Firstly, we verify the existence of a four-quarter structure in dividend increases, and that the tendency to increase dividends is rising over time. While 18% of firms followed the four-quarter structure in the 1960s, 55% of firms follow the structure in 2016. Secondly, we confirm that dividend increase announcements that follow the four-quarter structure have lower informational content than other dividends. We demonstrate this by conducting an event study analysis of the announcement effect of four-quarter dividend increases. The results reveal that these four-quarter dividend increases are associated with a significantly lower announcement return than other dividends. Furthermore, the results hold when controlling for dividend- and firm characteristics as well as unobserved heterogeneity. Moreover, the results are robust to a more restrictive definition of following the four-quarter structure, which we apply to challenge the findings of Andres and Hofbaur (2017). In summary, our findings provide support for previous research, and emphasize the importance of the four-quarter structure for the understanding of dividend signaling.

We further analyze the effect of firm characteristics on the probability that the firm adopts the four-quarter structure. The results support the findings by Andres and Hofbaur (2017) that firms who adopt the four-quarter structure are typically large, high-valued, frequently traded, have lower dividend yields and make small adjustments to dividends. Furthermore, the longer the firm has previously followed the four-quarter structure, the more likely it is to continue following it. Contrary to expectations, we find that increases in earnings negatively affect the probability of adoption, while the stability of earnings does not affect the decision. Finally, the fact that a firm is using share repurchases does not increase the likelihood of adoption. In brief, our results mostly confirm previous findings on what leads firm to adopt the four-quarter structure.

With respect to our new contribution to the literature, the analysis of peer effects, we find mixed support. We measure the effect of peer adoption by the share of peers who follow the four-quarter structure. Consistent with previous studies on peer effects, we define the peer groups according to the firms' three-digit SIC codes (Leary & Roberts, 2014). Moreover, we measure peer adoptions in the four quarters prior to the firm's decision time to ensure sufficient reaction time (Kaustia & Rantala, 2015). According to our hypothesized effect of peer adoptions, the probability of firm adoption should be increasing in the share of peer firms that follow the four-quarter structure. Our baseline results support this hypothesis, and the results are robust to the use of an alternative measure of peer adoption and an alternative regression model. Thus, the preliminary robustness tests support our hypothesis on peer effects.

In studies of peer effects, it is critical for researchers to define the peer groups (Manski, 1993). To test whether our findings are sensitive to the definition of peer groups, we conduct robustness tests with different peer group definitions. In doing so, we find that the results do not hold when defining peer groups according to four-digit SIC codes. On the other hand, when using the Fama and French 49 Industry Classification to define peer groups, we again see evidence of peer effects. To further test the robustness of our results, we use a different definition than Andres and Hofbaur (2017) of what justifies following a four-quarter structure. This further supports our baseline results, as there is significant evidence of peer effects. In short, the results to this point mostly support our hypothesis, that peer adoptions increase the likelihood that the firm adopts the four-quarter structure.

In our final robustness tests, we control for unobserved peer group factors that could affect the likelihood of adopting the four-quarter structure. In studies of peer effects, it is a methodological challenge to disentangle the effect of peer behavior from the impact of common underlying factors. The underlying factors could be market conditions or legislation specific to the peers, which make them follow the same behavior independently of each other. We find that our results are sensitive to the use of these controls for unobserved factors, and this challenges the significant results we find until this point. In some specifications, we find insignificant results on peer effects. This gives the indication that it is common factors in the peer group rather than the behavior of the peers that affects the firm's decision to adopt the four-quarter structure. However, whether our results remain significant to these robustness tests depends both on how we control for unobserved peer groups factors and how we measure the four-quarter structure. We conclude that we are unable to confirm the hypothesis, but we encourage further research to investigate this more, since several of our results show evidence of peer effects.

Furthermore, our paper provides support of the suggested association between following a four-quarter structure and increased dividend smoothing (Andres & Hofbaur, 2017). To test for the relation between the four-quarter structure and dividend smoothing, we include an indicator variable that shows whether the firm is following the four-quarter structure. Consistent with Andres and Hofbaur (2017), we find indications that firms who follow the four-quarter structure smooth dividends more than other firms.

This paper contributes to existing literature in several ways. Firstly, we confirm the findings by Andres and Hofbaur (2017), and this further emphasizes the importance of the four-quarter structure for dividend signaling and dividend smoothing. We thus support the argument that future research on these areas should control for the four-quarter structure in dividend increases. Furthermore, the verification of the existence of the four-quarter structure is important to investors. The investors can observe these predictable tendencies and use this knowledge in their assessment of dividend announcements (Andres & Hofbaur, 2017). In addition, the analysis of the probability of four-quarter adoption confirms previous findings, and this should inspire future research to dig deeper into this topic. We investigate whether peers affect the decision, but there are possibly other affects that could be analyzed. Finally, despite the mixed support for our hypothesis on peer effects, we find some support for the

hypothesis, so we cannot rule out that there are peer effects on the decision to follow the four-quarter structure. Moreover, our analysis has limitations in terms of identifying peer groups and controlling for unobserved peer group factors. Therefore, we encourage future research with more advanced methods of identifying peers and controlling for group factors.

This paper proceeds as follows. Chapter 2 positions our thesis in relation to existing literature, while Chapter 3 derives our testable hypotheses. Chapter 4 outlines the data collection procedure and exhibits summary statistics, and Chapter 5 explains our methods for testing the hypotheses. Chapter 6 presents our results, including robustness tests, and provides a critical discussion of our findings. Chapter 7 concludes.

# 2. Literature Review

Our research is related to the literature on dividend signaling and dividend smoothing, as we analyze the impact of the four-quarter structure on these topics. In addition, as we analyze the effect of peer adoptions on firms' adoption of the four-quarter structure, the study furthermore relates to the literature on peer effects on corporate policies. In this chapter, we explain how our thesis is related to these research areas.

## 2.1. Dividend Signaling Theory

Our research contributes to the literature on dividend signaling, more specifically to the novel area of the impact of the four-quarter structure on the informational content of dividends. The informational content of dividends is the focal point in the literature on dividend signaling, and there are different theories on why markets see new information from dividend changes (Andres & Hofbaur, 2017).[4] The general idea is that the market sees the firm's change in dividends as a signal of management's private information about future earnings. There is asymmetric information between the firm and the market, and managers can therefore use dividend changes to convey information to shareholders about the prospects of the firm. The markets see dividend increase announcements as a positive signal of firm prospects, and this should lead to a positive stock market reaction. Conversely, dividend decrease announcements are negative signal about future earnings, and this should result in a negative stock

[4] Some research focuses on the role of dividends in agency problems (Jensen, 1986; Easterbrook, 1984), while others focus on the cash flow signaling of dividends (Miller & Rock, 1985).

market reaction. This relation is formally described in the literature as the Dividend Signaling Hypothesis (Berk & DeMarzo, 2014).

The Dividend Signaling Hypothesis is one of the most widely researched topics in corporate finance, and generally there is support of the idea that markets see informational content in dividends. Pettit (1972) is among the first to test the hypothesis, and his findings support the hypothesis. He shows that an announcement of an increase in dividends leads to a significant positive stock market reaction, while an announcement of a dividend decrease results in a significantly negative stock price reaction. Using the same method as Pettit (1972), Aharony and Swary (1980) further support these findings, even when controlling for contemporary earnings announcements. This shows that there is informational content in dividends beyond earnings. While these studies analyze market reactions to dividend increases and decreases, Healy and Palepu (1988) show that the effects are even larger for more extreme dividend changes, initiations and omissions.[5] While there is generally support for the idea that stock markets react to dividend change announcements, it is less clear from the literature whether dividends are a reliable signal on future earnings. Watts (Wat73) is one of the first to analyze this. He forecasts earnings based on the relation between dividends and earnings and finds that the evidence on dividend signaling is inconclusive.[6] Laub (1976) argues that Watts's (Wat73) use of annual data is the reason for the lack of evidence, as quarterly data more adequately forecast earnings. Using the same model as Watts (Wat73) with quarterly data, Laub (1976) finds that dividend announcements do convey information. Healy and Palepu (1988) find that dividend initiations are followed by higher future earnings, thereby supporting the relation proposed by Laub (1976). However, they find that dividend omissions are not followed by negative earnings changes, so overall there is mixed evidence of the relation from the study (Healy & Palepu, 1988).[7] In summary, while there is mixed evidence for the relation between dividend changes and future earnings, it is generally accepted in the literature that markets see informational content in dividend announcements (Allen & Michaely, 2003).

In recent years though, research suggests that the informational content of dividends is becoming less pronounced. The empirical background for this research is Fama and French (2001), who demonstrate a declining use of dividends in public firms since 1978. Investigating this decline, Amihud and Li

[5] There are several studies showing a larger stock price reaction from extreme dividend announcements (Asquith & Mullins, 1983; Michaely et. al., 1995).
[6] Gonedes (1978) and Penman (1983) further support the findings that there is no informational content in dividends.
[7] Benartzi et. al. (1997) and DeAngelo et. al. (1996) show further empirical evidence against this relation.

(2006) show that this is because dividends hold less informational content. If dividends provide investors with less information about the firm's prospects, then given that they are costly, firms may stop using them.[8] In a recent paper, Andres and Hofbaur (2017) add new knowledge on the declining informational content of dividends. They show that dividends increasingly follow a predictable four-quarter structure, and that dividends which follow this structure have less informational content. When a dividend increase announcement is expected, there is less new information than in unexpected announcements. Therefore, the increased use of this predictable structure among dividend-increasing firms helps explain the declining information content of dividends (Andres & Hofbaur, 2017).

Having revealed a significant impact of the four-quarter structure on dividend signaling, Andres and Hofbaur (2017) further analyze what leads firms to follow the structure. They find that firms who follow the four-quarter structure are large, high-valued, have stable earnings, make only small increases to dividends, and use share repurchases as an alternative payout mechanism. This is the currently established knowledge on what leads firms to adopt the four-quarter structure, and our research contributes to this in two ways. Firstly, we verify the findings by Andres and Hofbaur (2017), to see if we find the same relation between firm characteristics and four-quarter adoption. Secondly, we further analyze whether there is evidence of peer effects on the firm's decision. To the best of our knowledge, the possibility of peer effects has not recently been tested in this setting, so our main contribution to the literature on dividend signaling is to fill this void.

## 2.2. Peer Effects on Corporate Policies

As we analyze whether there is evidence of peer effects on the probability of firm four-quarter adoption, our research is further related to literature on peer effects on corporate policies. There has been considerable attention to peer effects on firm decision-making in areas such as corporate governance (Bouwman, 2011) and corporate finance (Kaustia & Rantala, 2015; Leary & Roberts, 2014), but so far not to the area of four-quarter structures in dividend increases.[9] There is a general acknowledgement that firms do not operate in isolation, but that look to related firms to glean information about optimal decision making (Leary & Roberts,

[8] The authors show that the reduction of information asymmetry is due to an increased presence of institutional shareholders.

[9] It is important to specify that a very recent paper by Adhikari and Agraval (2018) studies peer influences on dividend policies. While similar in terms of theoretical motivation, that paper does not specifically address the four-quarter structure in dividend increases.

2014). There are different branches of literature on peer effects on corporate policies, in terms of how firms receive information from their peers. While these are all related to the general idea just presented, there are notable differences between how peers are related. In what follows, we explain the different areas of the literature, to position our research within the broader field of peer effects on corporate policies.

One area of the literature concerns social network effects, which demonstrates that social interactions among top management affect corporate decision-making. Prominent papers within this area are Bouwman (2011) and Shue (2013). Bouwman (2011) shows how corporate governance mechanisms are partially affected by networking effects among firms with common directors. Corporate governance mechanisms thus propagate across firms because directors discuss and implement the same practices across the firms where they sit on the board. Following a similar approach, Shue (2013) posits that social connections among top executives should be evident the financial policies of the firms they manage. Shue (2013) finds that firm outcome is significantly more homogenous for firms which have executives from the same MBA program sections. In brief, evidence supports that social relations among top management affect corporate polices.

Another area of the literature is information-based theory, which suggests that firms follow peers who have superior information (Adhikari & Agrawal, 2018). This view differs from the social network literature because it does not assume that the firms are related in terms of personal connections. Instead, firms have peers, whom they are related to because product or services similarity. As the peers face similar choices and similar industry conditions, the decisions by some peers could provide guidance to other peers on optimal course of action. Some of the most recent contributions within this field are Kaustia and Rantala (2015), Leary and Roberts (2014) and Foucault and Fresard (2013). These papers analyze the effect of peer decisions on the firm's policies. Foucault and Fresard (2013) demonstrate that peers' increases in investments are associated with increases in the firm's investments. Leary and Roberts (2014) contribute to the literature by showing that companies glean information from peers' capital structure decisions in deciding on their own level of debt. In doing so, Leary and Roberts (2014) develop a novel way to overcome endogeneity problems in studies of peer effects, by using the firm's idiosyncratic return as instrumental variable. Kaustia and Rantala (2015) study the effect of stock splits by peer firms on the likelihood that the firm

conducts a stock split. These authors point to a weakness of peer group definition in Leary and Roberts (2014), and they develop a new method of defining peer groups based on stock analyst coverage. This should better ensure that the firms are strategically related. In summary, information-based theories on peer effects argue that firms use peers' decisions as information in their own decision making.

Our paper is more generally related to the literature on social learning, which posits that individuals learn what is optimal to do from others' behavior (Kaustia & Rantala, 2015). Within this field, there are furthermore studies of outcome-based social learning. The general hypothesis in outcome-based social learning is that an individual learns not only from the behavior of others, but from the outcome of this behavior as well. For example, Kaustia and Rantala (2015) analyze whether firms are more likely to react to peer stock splits when these have been successful.[10]

Our study falls into the category of information-based theory, as we hypothesize that firms consider peer adoptions in their own decision on adopting the four-quarter structure. Our approach therefore differs from the theory on social network effects, as we do not define peer groups based on social relationships between managers. We instead define peers in terms of strategic relatedness and analyze whether firms incorporate information from peer behavior. Furthermore, while outcome-based social learning is an intuitive approach to studying how firms learn from peers, it is hard to measure the effect of successful four-quarter adoption. As previously mentioned, it is still not clearly documented how following a four-quarter structure adds value to the firm. Hence, our focus is on how firms learn from the actions by others. This summarizes how our analysis of peer effects relates to previous research in the field. Our study highly resembles Leary and Roberts (2014) and Kaustia and Rantala (2015) in terms of the general research setting.

## 2.3. Dividend Smoothing

Our paper is related to the theory of dividend smoothing, which Lintner (1956) introduces. Theoretically, firms have an equilibrium dividend level, and they make partial adjustments to

[10] In the sense of experiencing increased returns

dividends to reach this equilibrium level. The smaller the partial adjustments, the longer it takes to reach the equilibrium level, and the more dividends become smoothed across time (Lintner, 1956). Leary and Michaely (2011) document cross-sectional differences in dividend smoothing and show that some types of firms[11] smooth dividends more than others. They analyze dividend paying firms from 1925 to 2007, and further document that dividend smoothing has increased over time. As they find no explanation for this tendency in firm characteristics, Leary and Michaely (2011) leave this question open for further research. Andres and Hofbaur (2017) then show that following a four-quarter structure in dividend increases is associated with increased smoothing of dividends. This is perhaps a first step towards a better understanding of the tendency of increased dividend smoothing. As this finding is the only of its kind, we intend to contribute to the literature on dividend smoothing by verifying the association between dividend smoothing and the four-quarter structure.

# 3. Hypotheses Development

The previous chapter explains how our thesis is related to existing literature and how we contribute to these. In this chapter, we derive the hypotheses that we test to make these contributions to the literature in section 3.1. In addition, as we enter the literature on peer effects on corporate policies, our analysis faces the challenge of an endogeneity problem that is very specific to this field of literature. This has important implications on our ability to test for peer effects and make inferences from our results. Therefore, we explain the endogeneity threats to our study in section 3.2.

## 3.1 Derivation of Hypotheses

Our first hypothesis concerns the effect of the four-quarter structure on dividend signaling. We first explain why there is information content in dividend increases, and subsequently how the four-quarter structure should affect it. Dividend increases reflect managers' private information about positive expectations for future earnings. A dividend increase is a credible

[11] This is for example firms with high agency costs.

signal to the market because it conveys a substantial commitment from the firm.[12] Dividends are costly, so when the firm commits to a higher level of dividends, it must be confident about its prospect. Dividends are costly because they are heavily taxed compared to capital gains (John & Williams, 1985). Furthermore, increasing dividends might require raising external capital. In that case, the firm not only increases dividends but also interest payments (Bhattacharya, 1979; Ofer & Thakor, 1987). Moreover, by raising dividends the firm might be postponing investment plans or selling assets to finance the dividend increase (Miller & Rock, 1985). These costs are necessary for firms to produce what Amihud and Li (2006) call the sound partial signalling equilibrium. By making the commitment to increase dividends despite the substantial costs, markets perceive that management must have positive information to convey[13]. As a result, we should see an increase in the firm's stock price upon the announcement of a dividend increases.

Essentially, markets see dividends as a signal because there is information asymmetry between the firm and the market. This means that dividend increases usually come as a surprise to the market. Hence, if investors are expecting a dividend increase, it should not provide as much new information about the firm as an unexpected increase. Recent research shows that dividends are becoming more predictable, as corporate distribution announcements tend to recur on a calendar-linked basis (Bessembinder & Zhang, 2015). Andres and Hofbaur (2017) show evidence of a predictable structure in dividend increases, whereby firms make dividend increases every fourth quarter. In rational markets, investors should incorporate this predictability in the firm's dividend policy into the stock price. Consequently, for dividend increases that follow this four-quarter structure, there should be less new information compared to unexpected dividend increases. Therefore, we should see a lower abnor-

[12] Furthermore, firms should be reluctant to use dividend changes as signals unless they are confident that prospects are good. If dividend increases are not followed by positive results, markets would lose confidence in the firm. Consequently, the firm would lose the ability to use dividends for future signaling (Ross, 1977).
[13] Moreover, studies show that analysts update their expectations to the firm after announcements of dividend changes, suggesting that firms can actively use dividends for signaling (Ofer & Siegel, 1987).

mal announcement return for dividend increases that follow the four-quarter structure compared to other dividend increases. This leads to our first hypothesis, regarding the effect of the four-quarter structure on dividend increase announcements.

Hypothesis 1: The positive abnormal stock return following a dividend increase announcement is lower for dividend increases that follow a four-quarter structure than for other dividend increases.

With regards to the study of the probability of four-quarter adoption, we seek to verify the findings by Andres and Hofbaur (2017). Their study reveals seven significant determinants of adoption, and we test each of these in separate hypotheses to see whether we find a similar effect on the probability of adoption. In the following, we provide theoretical explanations as to how we expect the different firm characteristics to affect the likelihood of adopting the four-quarter structure.

Following the four-quarter structure implies that the firm will increase dividends for several consecutive years. As dividends are costly (Amihud & Li, The Declining Information of Dividend Announcements and the Effect of Institutional Holdings, 2006), firms who commit to following the four-quarter structure will probably increase dividends by small increments. In doing so, the firm limits the costs of the continual dividend increases, and this makes it more financially feasible to follow the four-quarter structure. We therefore expect the likelihood of four-quarter adoption to be negatively related to the relative dividend increase. This variable measures the rate of change between two consecutive dividend payments. Therefore, compared to firms who do not follow the four-quarter structure, firms who follow the structure should make lower increases in dividends. Consequently, this should be reflected in a lower rate of change for firms who adopt the four-quarter structure, as expressed by Hypothesis 2.i.

Hypothesis 2.i: The probability of following the four-quarter structure is negatively related to the relative change in dividends.

Concurrent with the notion of costly dividends, firms who already commit to paying high dividends, as measured by the dividend yield, should be less likely to start following the four-quarter structure. The higher the current dividend yield, the more difficult it is for the firm to start following the four-quarter structure, as it increases its financial commitments even

further. This leads to our hypothesis on the impact of the current dividend commitment on the probability of four-quarter adoption.

Hypothesis 2.ii: The probability of following the four-quarter structure is negatively related to the dividend yield.

We expect that the market to book value of the firm (MTB) positively affects the probability of following a four-quarter structure. Dividends are costly (Amihud & Li, The Declining Information of Dividend Announcements and the Effect of Institutional Holdings, 2006), so we expect that firms should have healthy growth prospects to start following the four-quarter structure. According to Sharma et.al. (2013), the MTB proxies for the firm's ability to deliver strong operating performance and growth prospects. Assuming management is interested in following the four-quarter structure because this is valuable to investors (Lintner, 1956). Sound growth prospects should give the firm the freedom to follow the four-quarter structure. Essentially, it gives an indication that the firm will have the cash flow to finance the ongoing increases in future years. This leads to our hypothesis on the effect of the MTB on the probability of four-quarter adoption.

Hypothesis 2.iii: The probability of following the four-quarter structure is positively related to the firm's market to book value.

We expect the size of the firm to positively influence the probability of four-quarter adoption. Fama and French (2001) find that dividend payers are typically larger firms. One reason could be that dividend increases entail transaction costs, and large firms should be better able to absorb these. The relation between size and dividend payouts is further supported by theories of firm life cycles, which suggest that firms start distributing assets when they reach a certain size (Sinn, 1991).[14] When firms follow the four-quarter structure, this entails making several consecutive dividend increases. Therefore, following the four-quarter structure likely requires more dividend increases than if the firm did not follow it. This should lead to higher

[14] Furthermore, Redding (1997) suggest that size is positively correlated with dividend payouts, as the stockholdings of larger firms are mostly held by dividend-preferring institutional investors.

transaction costs, and as larger firms can better absorb these (Fama & French, 2001), we expect larger firms to be more likely to adopt the four-quarter structure. This leads to Hypothesis 2.iv.

Hypothesis 2.iv: The probability of following the four-quarter structure is positively related to the size of the firm.

The next hypothesis concerns the variation in earnings, a highly significant determinant of four-quarter adoption in Andres and Hofbaur (2017). The variable proxies for earnings stability, and it measures the standard deviation of ROA over a trailing five-year period. Therefore, the lower variation, the more stable earnings. The more stable earnings, the more certainty around the firm's financial resources. This is most likely important for the decision on adopting the four-quarter structure, as the firm would need good forecasts for its financial resources to be confident that the increases are sustainable. We thus posit that the more stable earnings, the higher the likelihood of adopting the four-quarter structure. This leads us to our hypothesis on Earnings variation.

Hypothesis 2.v: Variation in earnings negatively affects the probability of following the four-quarter structure.

Andres and Hofbaur (2017) show that when the firm repurchases shares, it is more likely to follow the four-quarter structure. When firms use repurchases as an alternative payout channel to dividend increases, it gives managers flexibility in terms of payouts, as explained in Jagannathan et.al. (2000). If firms only use dividends as a means of payout to shareholders, following the four-quarter structure would constrain their ability to manage their use of proceeds. If a firm wants to increase dividends to shareholders in a quarter that falls outside the four-quarter intervals, it would have to break the four-quarter structure to make the dividend payout. When using repurchases, managers can rely on this alternative channel to distribute earnings, without abandoning the four-quarter structure. Based on this rationale, we formulate our hypothesis on the effect of being a repurchasing firm.

Hypothesis 2.vi: When the firm repurchases shares, it is more likely to follow the four-quarter structure.

At a given time, the firm may have followed the four-quarter structure consecutively for several years, and we measure this by a variable showing the firm's persistence in following the structure. The longer a firm has previously followed the four-quarter structure, the more likely it is that it continuous to follow it. Therefore, we expect the probability of adoption to be positively affected by the number of consecutive times that the firm has previously followed the four-quarter structure. The leads to our final hypothesis on the effect of firm characteristics on four-quarter adoption.

Hypothesis 2.vii: The probability that the firm follows the four-quarter structure is positively affected by the amount of consecutive times it has previously followed it.

Our next hypothesis concerns the effect of peer adoptions on the probability that the firm adopts the four-quarter structure, and we build this on a model of herd behavior. Banerjee (1992) argues that it can be rational for decision-makers to follow prior decisions by others when the choice is complex. To explain this, Banerjee (1992) develops a model that describes a decision tree for the agents who follow others' decisions. We apply this model to explain the peer effects we expect to see, as the scenario in the model fits our scenario of considering adopting the four-quarter structure. The model provides a detailed explanation of the mechanisms behind the decision to follow prior decision-makers, which is useful to derive our hypothesis. A limitation of the model is that it does not thoroughly account for the first-mover's decision. There is only limited explanation of how the first-mover makes decisions, and therefore it is somewhat unclear how it can be optimal to follow the first-mover. Nonetheless, we mainly use the model to explain the behavior of those who follow others, and we argue that this is sufficient for our research. To our best knowledge, there is no first-mover advantage in the decision to adopt the four-quarter structure. Hence, we assume that the motivation for the first-mover to adopt the four-quarter structure is that the firms finds it beneficial. We intend to build on previous research by challenging the view that the four-quarter adoption happens in isolation, and therefore our focus is on those who have others to observe. In the next part, we explain Banerjee's (1992) model and relate it to the decision on

adopting the four-quarter structure. This will lead to our hypothesis on peer effects on the firm's decision to follow a four-quarter structure.

In the herd behavior model by Banerjee (1992) there is a set of alternative investment options, of which only one is the optimal choice. The set of options is represented by a variety of assets, where the optimal investment is the asset with the highest return. Naturally, all decision-makers want to invest in this asset, but no one knows which one it is. This is a sequential game, so the population of agents make their investment decisions by turn.[15] There is information asymmetry, so agents do not know the motivation behind prior decision-makers' choices. In addition to observing previous decisions by others, the agents might have their own signal about the optimal asset. There is some probability that an agent has this signal, and there is a probability that the signal is correct. Hence, when making the investment decision each agent can rely on information from the prior choices by other agents and perhaps a private signal about the optimal asset.

The outcome of the model is a Bayesian-Nash equilibrium showing a decision tree for the agents. Any agent can choose to follow either her own signal or choose the same assets as prior decision-makers. This choice depends on whether others' decisions confirm the agent's signal, and whether there is a majority that chooses another asset. The first decision-maker clearly follows her signal if she has one, and otherwise simply choses some asset other than the optimal.[16] The agents that decide after the first decision-maker thus have prior decision-makers to observe, and perhaps a private signal. If the agent has a signal about an asset, she chooses this asset if at least one other agent has chosen the same asset before, since this confirms her signal. Moreover, even if no prior decision-makers have chosen that asset, she likewise follows her signal so long as there is not a majority who have chosen a different asset. However, if a majority of prior decision-makers choose another asset, the agent chooses this as well. This means that, even if an agent has a private signal, she chooses the same asset as

[15] Hence, no one makes the decision simultaneously.

[16] In Banerjee (1992), the first decision-maker choses asset *i*=0 if she does not have a signal. *i*=0 refers to all assets other than the optimal asset. This follows from Banerjee's (1992) Assumption A: When all prior decision-makers have chosen asset *i*=0, the current decision-maker choses this as well. As no one has selected an asset prior to the first decision-maker, this is equivalent to saying that they have all invested in *i*=0, some other asset than the optimal.

the majority. When the agent does not have a signal, she follows the majority as well. This summarizes the outcome of Banerjee's (1992) herd behavior model of how agents follow prior decision-makers. In what follows, we further elaborate on the motivation behind the agents' behavior.

The agent follows the majority because she believes they have superior information, although she does not know the reason behind their choice. However, she knows that there is some probability that the prior decision-makers have a signal about what is optimal. Moreover, if they have a signal, there is some probability that this signal is correct. When following the majority's decision, the agent infers that the probabilities behind the majority's choice are higher than those of her own signal. Since the majority has chosen this asset, the agent infers that they must have a better signal. Naturally, the effect amplifies as more agents chose the same asset one after another. This is then an example of herd behavior, whereby more and more agents chose the same asset because a majority has chosen it.

In this setting, better information would increase the probabilities of having a correct signal about the optimal asset. However, when information gathering is time-consuming, agents might be better off by inferring information from others' choices (Conlisk, 1980). Therefore, in the tradeoff between time-consuming information gathering and more certainty, it may be rational to follow the information conveyed by the majority's choice. In summary, the model suggests that agents use prior decision-makers' choices for information because they believe there is a high probability that this is optimal. Therefore, herd behavior can be rational when facing complex decisions.

The herding model by Banerjee (1992) applies to our setting of the decision to adopt the four-quarter structure, as this decision is complex and because firms can rationally use peers' decision. In our setting, the possibility to follow the four-quarter structure corresponds to the investment decision in Banerjee (1992). The firm is in a situation where it is capable of making several increases in dividends in future years, and it considers doing this according to the four-quarter structure. The firm might have indications about whether this is beneficial, in the same way as agents can have private signals in Banerjee (1992). To decide to follow the four-quarter structure, the firm should have some indication that this is beneficial. According to Lintner (1956) and Brav et. al. (2005), investors seem to value predictable dividends, as it signals that the firm is in a sound financial position. Furthermore, increasing dividends

continually is a credible signal because it is costly to the firm (Amihud and Li, 2006). Based on this, the firm might assess that following a four-quarter structure is beneficial.

Given that the firm believes this is beneficial, the question becomes whether it is capable of continually increasing dividends every fourth quarter. Andres and Hofbaur (2017) show how firms who follow the four-quarter structure have high MTB and stable earnings, so the firm would presumably look to its financial situation to consider whether it can sustain these continual dividends. The question then comes down to whether the timing is right. This makes the situation complex, as the firm is uncertain about its future. Even if MTB is high and earnings are stable currently, the outlook for the industry might change. Specifically, this depends on industry-specific factors such as demand for the firm's products or services and supplier bargaining power. If demand declines because of the appearance of substitute products, or if supplier prices increase because of consolidation among suppliers, the currently favorable prospects might deteriorate. The firm makes a considerable financial commitment by increasing dividends according to the four-quarter structure, so the outlook for the industry would likely be a decisive factor in the firm's decision. In brief, the firm faces uncertainty on whether the decision is beneficial and whether the timing is right. This uncertainty resembles the situation in Banerjee's (1992) model, where agents are unsure of the returns from their investment decisions.

The prior decisions by peers to adopt the four-quarter structure might be a good indication for the firm that this is beneficial. The firm and its peers are similar, as they have the same products or services and thereby the same customers and suppliers. The firm furthermore knows that the peers who are capable of increasing dividends face a similar choice on whether to follow the four-quarter structure. Given this similarity between dividend-increasing peers, prior decisions by peers to adopt the four-quarter structure could convince the firm that this is beneficial. There is information asymmetry in this setting, as in Banerjee (1992), meaning that firms do not know for certain why dividend-increasing peers adopt the four-quarter structure. However, given that they are similar in terms of industry outlook and face a similar decision, the firm would consider it plausible that peers adopt the four-quarter structure because it is beneficial. Moreover, the firm sees the decision as credible, since committing to the four-quarter structure is costly. Furthermore, we assume information gathering is complex as it involves market reports and costly analyses. Compared to the costly

process of gathering further information on industry outlook, the firm could decide to rely on the information conveyed from peer decisions. The firm would then infer that the peers who adopt the four-quarter structure have superior information about industry outlook, such that they are confident that adopting the four-quarter structure I beneficial.

As in Banerjee (1992), this impression becomes even more convincing the more peers that have previously adopted the four-quarter structure. Importantly, we propose that the potential effect of peer adoption is not the only determinant of four-quarter adoption. For a firm to adopt the four-quarter structure, it first requires that it finds the structure desirable, and believes it currently has the means to sustain it. The effect of peer adoptions would then be an additional factor in the decision. We intend to analyze whether this is evident, with the purpose of building onto Andres and Hofbaur's (2017) findings on what leads firms to adopt the four-quarter structure. In summary, firms could rationally infer from peer decisions to adopt the four-quarter structure that this would be beneficial. This impression should strengthen the more peers that adopt the four-quarter structure. Based on this, we formulate our hypothesis on the impact of peer behavior on the decision to adopt the four-quarter structure.

Hypothesis 3: The probability of following a four-quarter structure increases in the share of peers who follow the four-quarter structure.

In our final hypothesis, we seek to validate Andres and Hofbaur's (2017) finding that following the four-quarter structure is associated with more dividend smoothing. This does not imply that following a four-quarter structure causes firms to smooth dividends more, but simply that firms who follow the four-quarter structure are likely to smooth more. Following Andres and Hofbaur (2017), we base this hypothesis on the similarity between the four-quarter structure and the theory of Skinner (2008) on the weakened link between dividends and earnings. Leary and Michaely (2011) suggest that this weakened link could affect smoothing, so based on the similarity between this theory and the four-quarter structure, we explain why using the four-quarter structure should be associated with more dividend smoothing.

Lintner (1956) proposed that the change in earnings is an important determinant of dividend levels, but Skinner's (2008) findings suggest this relation is weakening. Skinner (2008)

explains the weakened link by an increased preference for share repurchases over dividends. As firms are reluctant to cut dividends, they prefer paying out temporary earnings increases in the form of share repurchases. Moreover, Skinner (2008) shows that earnings generally have become less predictable, as seen by a higher variation in earnings since the 1980s. Dividend policies thus become more conservative and stable while earnings become more unstable, and this results in a weakening link. When the relation between earnings and dividends becomes weaker, there is less tendency among firms to adjust dividends according to earnings changes. It thus takes longer time to reach the equilibrium level of dividends, which is consistent with dividend smoothing.

As argued by Andres and Hofbaur (2017), following a four-quarter structure makes dividends more predictable. This is consistent with Skinner (2008) finding that dividend policy is more conservative. Since there is generally more variation in earnings, all firms experience a weakening link between earnings and dividends. Moreover, since firms who are using the four-quarter structure have more predictable dividends than other firms, firms that follow the structure should smooth dividends more than others. This intuition is also supported by previous findings of how firms that follow the four-quarter structure tend to make smaller dividend increases than those who do not follow the structure (Andres & Hofbaur, 2017). Essentially, it should take longer time for firms following a four-quarter structure to reach an equilibrium level in dividends, as they smooth dividend increases over a longer period. We intend to verify this result according to Hypothesis 4.

Hypothesis 4: Following the four-quarter structure is associated with higher dividend smoothing.

## 3.2. Endogeneity Threats in Studies of Peer Effects

Peer effects might be theoretically intuitive, but it is methodologically challenging to analyze due to the reflection problem (Manski, 1993). This is a special type of endogeneity in studies of social effects, which makes it hard to determine whether the actions or characteristics of a group affect the actions of the individuals that make up the group. It is called the reflection problem because the challenge is similar to the difficulty of determining the sequences of movements of a person and the simultaneous movement of his reflection. The question is whether it is the person's movement that affects the reflection or the other way around. In

studies of social effects, the challenge is to determine whether it is the behavior of the group or common group factors that affect the group members. There might be common factors to the group which drive the behavior of its members independently of each other. In practice, indications of significant social effects might therefore simply capture common group factors that affect the behavior of its members.

The research setting in Leary and Roberts (2014) exemplifies this very well. They study the effect of peers' financial policies on the firm's capital structure choice. Any correlation between peers' financial policies and the firm's financial policies could be due to unobserved common factors that affect both the peers and the firm. In this case, firms would be changing their financial policy because underlying circumstances changed, not because peers changed their policies. These unobserved factors lead to correlated effects, and not the social effects that studies try to determine (Manski, 1993).

In our study, the decision by the firm to adopt the four-quarter structure might not be a result of peers choosing to adopt the structure. It might instead be that common fundamentals have encouraged all firms in the peer group to follow the four-quarter structure. It is challenging to rule out this possibility, but we try to account for it with endogeneity robustness tests in our analysis. We do this by controlling for peer group-specific tendencies in four-quarter adoption as well as industry fixed-effects. Ideally, we would apply an instrumental variable regression, to further address the possibility of unobservable shocks driving adoptions within the peer groups, in line with Kaustia and Rantala (2015) and Leary and Roberts (2014). However, it is difficult to come up with an adequate instrument in our analysis, and we acknowledge that this limits our possibilities of reducing endogeneity threats. Therefore, while the controls we use for unobserved factors are our best available measures, the inferences from our analysis are made with reservations for this limitation.

## 4. Data

This section outlines our sample selection procedure and presents summary statistics. We collect two distinct samples, one related to Hypotheses 1 to 3, and one for Hypothesis 4. The samples differ since the study of four-quarter dividend structures uses quarterly data, whereas the analysis of dividend smoothing uses annual data (Andres & Hofbaur, 2017). In the following, we firstly present the sample selection process for the data related to Hypotheses 1 to 3. Secondly, we explain the corresponding

process for the sample related to Hypothesis 4. Thirdly, we present summary statistics for the data. Appendix Table A provides an explanation of variable construction, so generally when we refer to variables in the paper this is where we explain them. The explanation of the construction of variables shows all the CRSP and COMPUSTAT items we have retrieved in this process.

## 4.1. Sample Selection for Hypothesis 1 to 3

For the analyses of Hypotheses 1 to 3, we use a sample of all dividend observations for the descriptive data in section 6.1, and a subsample of only dividend increases[17] to test the hypotheses in sections 6.2 to 6.4. We therefore first explain how we retrieve the entire data sample of dividend observations, before specifying the construction of the subsample of dividend increases. This study analyzes the serial structure companies employ to adjust dividend payments, and we therefore focus on the population of dividend paying firms. We retrieve the data from the CRSP database[18], and we generate the sample as follows:

(1) We set the time-period from January 1926 to December 2016, which is the entire time-period available in CRSP.[19]
(2) We exclude regulated industries (SIC 6 (Financials) and SIC 49 (Utilities)).
(3) To analyze only dividend paying firms, we restrict the sample to include only ordinary taxable dividends paid on a quarterly basis in the US (distribution code 1232), in line with previous literature (Nissim & Ziv, 2001; Andres & Hofbaur, 2017).[20]
(4) Consistent with Andres and Hofbaur (2017), we restrict the share codes to 10 and 11, to include only common ordinary shares, and we use only stocks listed on NYSE, AMEX or NASDAQ (exchange codes: 1, 2 or 3).

[17] We could have analyzed four-quarter structures in a sample of all COMPUSTAT firms. However, comparing firms that adopt a four-quarter structure to all COMPUSTAT firms might induce biased inferences. Some characteristics might be similar for dividend-increasing firms that did not follow the four-quarter reference structure. In other words, the four-quarter indicator might simply proxy for firm characteristics associated with dividend increases in general. Therefore, to directly compare increases that are part of the four-quarter cycle to the remaining dividend increases in our sample should give a cleaner effect of following the four-quarter structure (Andres & Hofbaur, 2017).
[18] Accessed via the Wharton Research Data Services (WRDS), using the CRSP Daily Stock Query Designer.
[19] At the time of writing the Thesis.
[20] Andres and Hofbaur (2017) document that 95% of dividends in the US are paid on a quarterly basis, so we focus on this subset of the dividend paying population.

To measure the change in dividends, we calculate the rate of change between two consecutive dividend announcements. We account for rounding errors in CRSP by requiring that the dividend change be higher than 0.5%, consistent with Andres and Hofbaur (2017). Having conducted these steps, our sample includes four types of dividend payments: initiations, increases, decreases and stable dividends. Initiations are the first time a firm appears on the CRSP tape. For the sake of completeness, we further include dividend omissions. These observations are defined as quarters in which dividends have been absent for at least 270 days, after the firm has paid dividends for the last eight consecutive quarters.[21] After we include omissions, the dividend payment that follows the omission becomes a resumption.[22] This procedure yields a sample of 296,641 dividend observations. In this panel, the entity is the firm, defined by the permno code in CRSP, and the time-period is the year-quarter. In addition to this, all observations have a dividend amount, a dividend declaration date, a rate of change since last payment, as well as an indication for the type of dividend payment.[23]

Hypotheses 1 to 3 concern only dividend increases, so to test the hypotheses we create a subsample of dividend-increase observations. Furthermore, we retrieve COMPUSTAT quarterly data[24] for the firms included in this subsample and merge it with the CRSP data, to facilitate the construction of the variables used in the regression specifications. In addition to the characteristics described in the previous paragraph, this panel for dividend increases has values for these variables. The data retrieval from COMPUSTAT includes data from 1961 to 2016. However, as the quality of COMPUSTAT data collection improved greatly after 1973 (Andres & Hofbaur, 2017), most analyses involving COMPUSTAT data will only include observations from around this period. This is a consequence of removing observations with missing values for the variables included in the regression model. As a final comment, we are not able to create all the same variables as Andres and Hofbaur (2017) due to a lack of data availability.

[21] To find these observations, we firstly identify breaks between dividends for the same firm that exceed 270 days, where the firm has paid dividends for eight consecutive quarters prior to the break. The new observation for omission that we generate is thus three quarters (270 days) after the last dividend payment prior to the break. For example, if a break of above 270 follows a dividend payment in Q2 2007, an omission has taken place in Q1 2008.
[22] The dividend payment after the omission might previously have been any of the other types of changes, however, seen in relation to the omission, it becomes a resumption of dividend payments.
[23] Such as an increase, decrease, stable dividend etc.
[24] Accessed via the Wharton Research Data Services (WRDS), using the Fundamental Quarterly Query Designer.

Thus, any differences in variable inclusion between that paper and this thesis is due to limitations to our data access.

## 4.2. Sample Selection Hypothesis 4

Our sample selection procedure for Hypothesis 4 follows Leary and Michaely (2011), and we use the COMPUSTAT database for retrieving annual data.[25] We collect the sample as follows:

(1) We set the time-period from January 1950 to December 2016, which is the entire sample period available in COMPUSTAT Annual.
(2) We exclude regulated industries (SIC 6 (Financials) and SIC 49 (Utilities)).
(3) To restrict the sample to only dividend paying firms, we remove observations where the dividend per share (DPS) is zero.
(4) For these dividend-paying firms, we keep only observations that have at least ten years of consecutive data for $DPS_t$, $DPS_{t-1}$, earnings per share ($EPS_t$) and the share adjustment factor (ajex). This is to ensure that there is sufficient data for calculating the smoothing measure over time.

Making these restrictions, we end up with a sample of 57,515 observations. The COMPUSTAT variables retrieved for this analysis apart from those mentioned in the sample selection procedure appear in Appendix Table A. The entity in this panel is again the firm, indicated by CUSIP codes in COMPUSTAT, whereas the time-period refers to the calendar year. Apart from these, the panel consists of a variety of variables dependent on the regression specification, which we explain in the test of Hypothesis 4.

## 4.3. Summary Statistics

This section presents summary statistics for our sample of dividend observations and the continuous variables described in Appendix Table A. Firstly, we present detailed summary statistics for the sample of dividend observations, by breaking down the sample into announcement decade, announcement quarter and industry. Secondly, we look at the subsample related to only dividend changes during the sample period to see how they have

[25] Accessed via the Wharton Research Data Services (WRDS), using the Fundamental Annual Query Designer.

developed over time. Thirdly, we present statistics for continuous firm characteristic variables, which we use in testing Hypothesis 1 to 3. Finally, we look at the correlation between these firm characteristic variables.

Table 4.3.1 reports the of total 296,641 dividend observations in our sample. The major part of the sample is stable dividends, which constitutes 82% of all dividends observations. This large fraction of stable dividends is similar to those found in previous literature (Andres & Hofbaur, 2017; Aharony & Swary, 1980; Nissim & Ziv, 2001). The relative share of resumptions, omissions, decreases, increases and initiations are 0.82%, 0.81%, 3.27%, 11.15% and 2.75%, respectively. In terms of the shares of increases and decreases, these ratios likewise correspond to what previous literature finds. These studies explain the relatively larger share of increases to decreases by managerial reluctance to cut dividends (Lintner, 1956; DeAngelo et. al., 1992; DeAngelo et.al., 1996).

Table 4.3.1 shows summary statistics for all dividend announcements in our sample period. Panel A shows how the five types of dividend changes are split across time. The five different types illustrated in the table are initiations, resumptions, increases, decreases and omissions. The total amount of dividend observations in the rightmost column further includes stable dividends. Reading from the top and down in each column, the table displays when in time these different dividend changes have occurred. Looking at the column with all observations, the rightmost column, it exhibits a downward trend in dividend announcements in recent decades. It shows a large increase in dividend announcements in the post-war period, with a peak in the 1970s, followed by a decline until the present day from 22% in 1970-1979 to 10.8% in 2000-2009. This is consistent with Fama and French (2001), who document a decline in the use of dividends since the 1970s.

Next, we look at when firms make these dividend announcements. Dividends in the US are typically paid on a quarterly basis, and it would be reasonable to expect that dividend announcements cluster around the first quarter of the year at the time of the announcement of the annual report. It could also be at the time of the general assembly, which is often in the second quarter of the year (Andres & Hofbaur, 2017). Earlier studies indeed suggest that dividend announcements cluster around the turn of the fiscal year (Watts, 1973). In line with (Andres & Hofbaur, 2017), we find no clear signals of clustering when it comes to dividend increases or decrease, the two most frequent types of changes. On the contrary, these are

rather uniformly distributed across the four quarters of the year, as shown in Panel B. The picture is the same when looking at the fiscal quarters, as shown in Panel C. As for the less frequent types of changes, there are weak signs of clustering, such as the 56.7% of resumptions and 44.1% of initiations that occur in quarter one. Overall, no clear tendency emerges from the timing of dividend announcements.

Panel D breaks down the dividend changes in our sample into Fama and French 12 Industry Classifications. Dividend changes are somewhat clustered within Manufacturing, with 25% of increases and 28.5% of decreases clustered within this sector. Non-durables and Shops also make up a large pile of dividend changes. Together, these three industries make up 54.2% of increases and 57.2% of decreases. This seems reasonable, since these three industries make up the majority of dividend paying firms, as seen in the rightmost column of Panel D.

## Table 4.3.1

Summary Statistics for the Sample of Dividend Payments
This table displays the total sample of quarterly observations broken down by announcement decade (Panal A), announcement quarter (Panel B and Panel C), and industry (Panel D).

| Group: | Initiations | | Increases | | Decreases | | Resumptions | | Omission | | All obs. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Period: | | | | | | | | | | | | |
| 1926-1949 | 824 | 14.5% | 811 | 2.5% | 811 | 8.4% | 711 | 29.1% | 995 | 41.2% | 19,010 | 6.4% |
| 1950-1969 | 1,237 | 21.8% | 4,253 | 12.9% | 1,834 | 18.9% | 763 | 31.2% | 519 | 21.5% | 60,217 | 20.3% |
| 1970-1979 | 1,688 | 29.7% | 9,271 | 28.0% | 1,819 | 18.7% | 338 | 13.8% | 336 | 13.9% | 65,337 | 22.0% |
| 1980-1989 | 553 | 9.7% | 6,889 | 20.8% | 2,491 | 25.7% | 245 | 10.0% | 264 | 10.9% | 55,053 | 18.6% |
| 1990-1999 | 529 | 9.3% | 4,414 | 13.3% | 1,466 | 15.1% | 151 | 6.2% | 130 | 5.4% | 41,788 | 14.1% |
| 2000-2009 | 440 | 7.7% | 3,639 | 11.0% | 783 | 8.1% | 113 | 4.6% | 144 | 6.0% | 31,903 | 10.8% |
| 2010-2016 | 408 | 7.2% | 3,818 | 11.5% | 501 | 5.2% | 126 | 5.1% | 29 | 1.2% | 23,333 | 7.9% |
| Total | 5,679 | 100.0% | 33,095 | 100.0% | 9,705 | 100.0% | 2,447 | 100.0% | 2,417 | 100.0% | 296,641 | 100.0% |
| | | | | | | | | | | | | |
| Panel B: dividend observations according to the declaration quarter | | | | | | | | | | | | |
| Quarter | | | | | | | | | | | | |
| 1 | 2,502 | 44.1% | 9,536 | 28.8% | 2,415 | 24.9% | 1,387 | 56.7% | 360 | 14.9% | 73,581 | 24.8% |
| 2 | 1,007 | 17.7% | 7,668 | 23.2% | 2,539 | 26.2% | 288 | 11.8% | 539 | 22.3% | 74,597 | 25.1% |
| 3 | 1,136 | 20.0% | 7,253 | 21.9% | 2,607 | 26.9% | 266 | 10.9% | 1,181 | 48.9% | 74,546 | 25.1% |
| 4 | 1,034 | 18.2% | 8,638 | 26.1% | 2,144 | 22.1% | 506 | 20.7% | 337 | 13.9% | 73,917 | 24.9% |
| Total | 5,679 | 100.0% | 33,095 | 100.0% | 9,705 | 100.0% | 2,447 | 100.0% | 2,417 | 100.0% | 296,641 | 100.0% |
| | | | | | | | | | | | | |
| Panel C: Dividend observations according to the fiscal quarter (fiscal year information drawn from COMPUSTAT not available before 1950) | | | | | | | | | | | | |
| Quarter | | | | | | | | | | | | |
| 1 | 683 | 33.9% | 6,591 | 32.0% | 1,250 | 22.8% | 275 | 38.4% | 155 | 24.7% | 41,099 | 24.9% |
| 2 | 472 | 23.4% | 5,525 | 26.8% | 1,468 | 26.8% | 182 | 25.4% | 154 | 24.6% | 41,622 | 25.2% |
| 3 | 442 | 21.9% | 4,183 | 20.3% | 1,606 | 29.3% | 138 | 19.3% | 185 | 29.5% | 41,320 | 25.1% |
| 4 | 418 | 20.7% | 4,318 | 20.9% | 1,150 | 21.0% | 121 | 16.9% | 133 | 21.2% | 40,888 | 24.8% |
| Total | 2015 | 100.0% | 20,617 | 100.0% | 5,474 | 100.0% | 716 | 100.0% | 627 | 100.0% | 164,929 | 100.0% |
| | | | | | | | | | | | | |
| Panel D: Industry breakdown | | | | | | | | | | | | |
| Industry | | | | | | | | | | | | |
| 1_NoDur | 736 | 13.0% | 4,817 | 14.6% | 1,383 | 14.3% | 417 | 17.0% | 412 | 17.0% | 43,733 | 14.7% |
| 2_Durbl | 270 | 4.8% | 1,788 | 5.4% | 576 | 5.9% | 167 | 6.8% | 166 | 6.9% | 16,152 | 5.4% |
| 3_Manuf | 1,225 | 21.6% | 8,275 | 25.0% | 2,770 | 28.5% | 794 | 32.4% | 764 | 31.6% | 79,686 | 26.9% |
| 4_Energy | 252 | 4.4% | 1,447 | 4.4% | 481 | 5.0% | 142 | 5.8% | 139 | 5.8% | 15,424 | 5.2% |
| 5_Chems | 224 | 3.9% | 2,169 | 6.6% | 504 | 5.2% | 122 | 5.0% | 120 | 5.0% | 17,555 | 5.9% |
| 6_BusEq | 468 | 8.2% | 2,150 | 6.5% | 616 | 6.3% | 131 | 5.4% | 134 | 5.5% | 20,473 | 6.9% |
| 7_Telcm | 118 | 2.1% | 789 | 2.4% | 158 | 1.6% | 32 | 1.3% | 29 | 1.2% | 5,778 | 1.9% |
| 9_Shops | 783 | 13.8% | 4,834 | 14.6% | 1,397 | 14.4% | 269 | 11.0% | 259 | 10.7% | 41,693 | 14.1% |
| 10_Hlth | 209 | 3.7% | 1,637 | 4.9% | 361 | 3.7% | 38 | 1.6% | 34 | 1.4% | 11,180 | 3.8% |
| 12_Other | 1,394 | 24.5% | 5,189 | 15.7% | 1,459 | 15.0% | 335 | 13.7% | 360 | 14.9% | 44,967 | 15.2% |
| Total | 5,679 | 100.0% | 33,095 | 100.0% | 9,705 | 100.0% | 2,447 | 100.0% | 2,417 | 100.0% | 296,641 | 100.0% |

In Figure 4.3.1, we illustrate how this propensity to change dividends has developed over time. We divide the sample of dividend payers into three groups. Group (i): firms that do not change their dividends within one year, Group (ii): firms that change dividends exactly one time per year, and Group (iii): firm that adjust their dividends more than once per year. The fraction of firms changing dividends once a year decreased from 35% in the 1930s to five percent in 1943. The fraction increases in the post-war period from this low point to around 72% in 1973 and then decreases to 37% in 2000 (all numbers expressed as 5-year moving averages). The fraction of firm with more than one dividend change is also highest in 1973, accounting for 22 percentage points of the 72%. Dividend-paying firms have become more active in adjusting dividends since 2000, with 62% of firms changing their dividends in 2016 at least once per year. The fraction of firms with more than one dividend change is always the lowest fraction, and it rarely exceeds 10% in the 87-year period. The average for firms with more than one dividend change is eight percent for the entire sample period. Overall, the figure shows that the propensity to adjust dividends is not much lower now than in the 1970s, despite the gradual decrease in the number of firms who use dividends in general since then.

**Figure 4.3.1**

Number of Dividend Changes per Firm–Year. This figure displays the frequency of dividend changes (5-year moving average) per firm–year for the period 1930 to 2016.

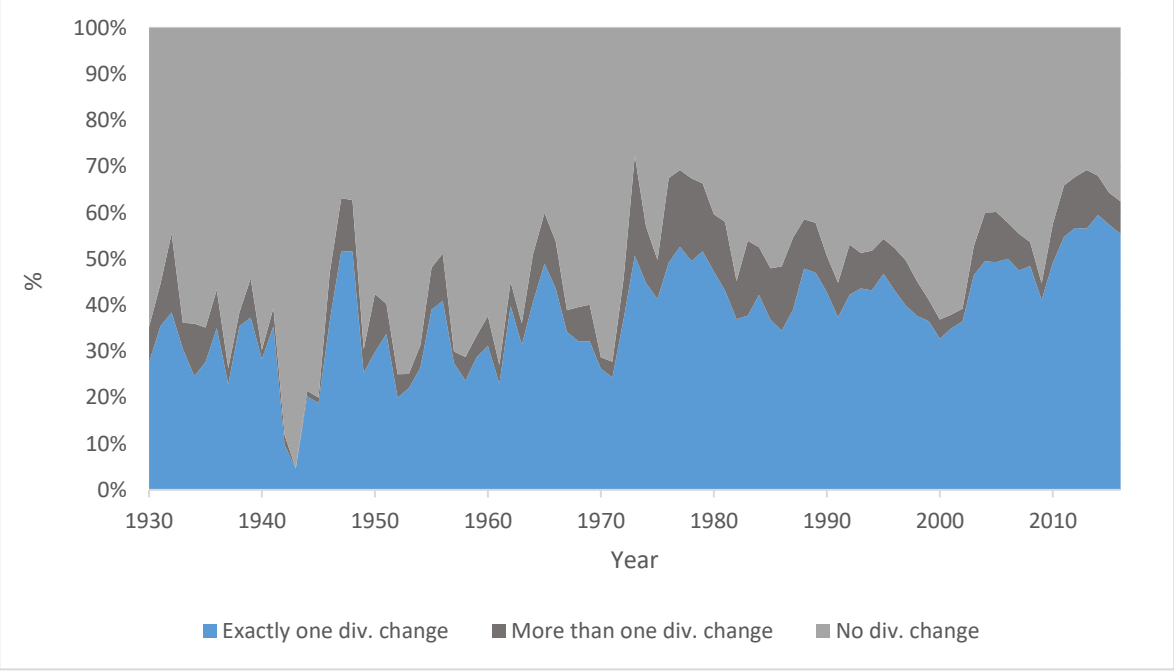


Table 4.3.2 shows summary statistics for the continuous variables we use as proxies for firm characteristics in testing Hypotheses 1 to 3. To limit the impact of extreme observations in these analyses, we winsorize the variables at 1st and 99th percentiles. To illustrate the impact of winsorizing, Table 4.3.2 first presents the raw data in the left half of the table, and then the winsorized version in the right-hand side. We see a considerable change in the summary statistics for some of the variables in Table 4.3.2. The maximum value of the relative change in dividend (D. rel. div) changes from 100 to 1.5. In addition, the standard deviation change from 1.44 to 0.211 and the mean change from 0.258 to 0.194. On the other hand, the summary statistics for illiquidity variation hardly change. Appendix Table 4.3.1 shows more summary statistics for these variables, including their medians.

**Table 4.3.2**
Summary Statistics for Continuous Variables – Hypotheses 1-3

| | | Raw Data | | | | Winzorized Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | N | Mean | Std. Dev | Min | Max | Mean | Std. Dev | Min | Max |
| D. rel. div. | 17,619 | 0.2588 | 1.4400 | 0.0051 | 100.000 | 0.1939 | 0.2111 | 0.0213 | 1.5000 |
| Div. yield | 17,619 | 0.0311 | 0.0344 | 0.0006 | 2.7937 | 0.0303 | 0.0184 | 0.0041 | 0.0925 |
| MTB | 13,186 | 1.7520 | 0.9731 | 0.5485 | 14.5754 | 1.7354 | 0.8694 | 0.7398 | 5.5133 |
| Size | 13,186 | 6.7986 | 2.1569 | 1.4598 | 13.1389 | 6.7980 | 2.1408 | 2.4071 | 11.9560 |
| LVG | 13,186 | 0.2239 | 0.1546 | 0.0000 | 3.3770 | 0.2219 | 0.1420 | 0.0023 | 0.6663 |
| ROA | 13,186 | 0.0267 | 0.0179 | -0.6247 | 0.3963 | 0.0266 | 0.0139 | -0.0046 | 0.0822 |
| DROA | 13,186 | 0.0052 | 0.0138 | -0.1830 | 0.6543 | 0.0050 | 0.0097 | -0.0213 | 0.0490 |
| Earnings variation | 12,515 | 0.0114 | 0.0110 | 0.0001 | 0.4494 | 0.0111 | 0.0081 | 0.0018 | 0.0510 |
| ILLIQ | 12,154 | 0.0032 | 0.0114 | 0.0000 | 0.2628 | 0.0029 | 0.0083 | 0.0000 | 0.0543 |
| Repurchases | 12,154 | 43.4902 | 321.7443 | 0.0000 | 14,399 | 29.1781 | 127.9046 | 0.0000 | 984 |

Table 4.3.3 shows the correlation between the winsorized variables summarized in the table above, which we refer to in section 6.2.[26] MTB has a correlation of 0.476 and 0.488 with Size and ROA, respectively. The correlation between Size and ROA is rather modest at 0.044. In addition, Size also has a rather high negative correlation with illiquidity, of -0.542.[27]

**Table 4.3.3**
Correlation Matrix for Continuous Variables – Hypothesis 1-3

| | D. rel. div. | Div. yield | MTB | Size | LVG | ROA | DROA | Earnings variation | Repur-chases |
|---|---|---|---|---|---|---|---|---|---|
| D. rel. div. | 1 | | | | | | | | |
| Div. yield | -0.0229 | 1 | | | | | | | |
| MTB | 0 | -0.3887 | 1 | | | | | | |
| Size | -0.0777 | -0.296 | 0.4755 | 1 | | | | | |
| LVG | -0.0356 | 0.0419 | -0.1286 | 0.0761 | 1 | | | | |
| ROA | 0.0746 | -0.023 | 0.4879 | 0.0443 | -0.1496 | 1 | | | |
| DROA | 0.1481 | -0.0239 | 0.0808 | -0.1123 | -0.0641 | 0.38 | 1 | | |
| Earnings variation | 0.2015 | 0.0077 | 0.1349 | -0.0298 | -0.0589 | 0.2058 | 0.1654 | 1 | |
| Repurchases | -0.0142 | -0.065 | 0.1551 | 0.3822 | 0.053 | 0.0352 | -0.0376 | -0.0011 | 1 |
| ILLIQ | 0.1006 | 0.197 | -0.2426 | -0.542 | -0.0367 | -0.0011 | 0.0995 | 0.0377 | -0.0789 |

# 5. Method

In this chapter, we explain how we test our hypotheses. We start by defining the four-quarter structure, as this is a central topic in this paper. Thereafter, we explain how we test each of our hypotheses, in terms of how we define the major explanatory variables and set up the regression models.

## 5.1. The Four-quarter Structure

The four-quarter structure refers to the documented tendency that firms increase their dividends every fourth quarter (Andres & Hofbaur, 2017). Hence, when a firm is following the four-quarter structure, it increases its dividends in the same quarter every year. It is

[26] The sample for the analysis of dividend smoothing contains only two continuous variables, so we move this to the appendices.
[27] We consider it highly surprising to see absolutely no relation between MTB and D.Rel.Div. However, we are unable to discover indications of errors in the winsorized data.

important to clarify that the term "four-quarter structure" refers only to firms that *increase* dividends. The four-quarter structure concept could easily be misinterpreted as referring to firms that simply pay dividends or change dividends every fourth quarter. We use both "adopt" and "follow" to indicate that a firm uses the four-quarter structure, without distinguishing between the two words.[28] The four-quarter structure is a policy that the firm undertakes for its dividend increases, and as any firm policy, the firm can change it again. Hence, when a firm adopts the four-quarter structure, it does not imply that it follows it for the rest of the sample period. Andres and Hofbaur (2017) apply three alternative indicator variables to show whether a firm is following the four-quarter structure, although they predominantly use only one of these. We use the same indicator variables as Andres and Hofbaur (2017), which we explain in the next paragraph.

The first indicator variable is labeled 4-Qtr. structure, and it takes the value of one if the current dividend increase follows exactly four quarters after the most recent dividend increase. Hence, if the current dividend increase takes place in Q2 1992[29], and the latest dividend increase occurred in Q2 1991, the 4-Qtr. structure takes the value of one. This means that the firm has followed the four-quarter structure in Q2 1992. The second indicator variable is denoted 2 year 4-QRS. This takes the value of one if the current increase follows exactly four quarters after the most recent increase and exactly eight quarters after the increase before that. The firm follows the four-quarter structure if it makes its current dividend increase in Q2 1992, the latest increase occurred in Q2 1991, and the increase prior to that took place in Q2 1990. The third indicator variable is called Post-4QRS. This variable indicates whether the firm has previously followed the four-quarter structure. Post-4QRS takes the value of one in the first period where the variable 4-Qtr. Structure equals one, and for all quarters thereafter. For example, if the firm follows the four-quarter structure for the first time in Q2 1992, the Post-4QRS equals one in this quarter and for the rest of the time the firm is in the sample. Hence, regardless of when the firm increases its dividend after Q2 1992

[28] Andres and Hofbaur (2017) who coined the term make use of both verbs without distinguishing between the interpretation, and we therefore do the same.
[29] The second quarter of 1992.

occur, this variable simply indicates that the firm has previously followed the four-quarter structure in all periods thereafter.

We use both the 4-Qtr. structure and 2 year-4QRS variables for indicating whether firms follow the four-quarter structure when testing Hypotheses 1 to 3, while we apply the Post-4QRS only for Hypothesis 4. Andres and Hofbaur (2017) predominantly use the 4-Qtr. structure variable in their analysis, and almost all their findings are based on this measure. We argue that the 2 year-4QRS should be used more for robustness tests, as the 4-Qtr. structure includes some coincidental four-quarter adoptions. There are several observations in the data where the firm adopts the four-quarter structure in one quarter but does not follow it four quarters later. The problem with these observations is that they appear coincidental, as it does not seem to be a deliberate dividend policy. It could be coincidental if the firm simply increases dividends four quarters after the latest increase due to extraordinary earnings and does not follow the four-quarter structure again. In this case, the four-quarter sequence between the increases does not reflect a decision to follow the four-quarter structure.

To facilitate an easier understanding of how we measure the four-quarter adoption in this paper, we use distinct definitions of the four-quarter structure variables. Essentially, the 2 year-4QRS variable is a more restrictive version of 4-Qtr. structure variable. The 2 year-4QRS requires one more consecutive increase in four-quarter intervals to justify that a firm is following the structure. Hence, we refer to our use of indicator variables in Hypotheses 1 to 3 as the unrestricted and restricted definitions of when a firm is following the four-quarter structure. The unrestricted definition is when we use the 4-Qtr. structure variable, and the restricted definition is when we apply the 2 year-4QRS. In addition, when we use the Post-4QRS variable in Hypothesis 4, we simply refer to it as the post-adoption definition. In summary, these are the different ways we measure four-quarter adoption. In Hypotheses 1 to 3, we generally use the unrestricted definition of the four-quarter structure to make our results comparable to Andres and Hofbaur (2017). Moreover, we use the restricted definition of the four-quarter structure in some robustness tests in Hypotheses 1 and 3, to see if the results are sensitive to the definition of the four-quarter structure.

## 5.2. Method for Testing Hypothesis 1

In Hypothesis 1, we analyze whether investors react less positively to dividend increase announcements that follow a four-quarter structure. We conduct an Ordinary Least Square (OLS) event study analysis, and define our first regression model as follows:

$$CAR_{it}\,[-1,1] = \alpha_1 + \beta_1 * 4 - Qtr.structure_{it} + \varepsilon_{it} \qquad \text{(Equation 5.2.1)}$$

Where $CAR_{it}\,[-1,1]$ is the cumulative abnormal return in a three-day window around the dividend announcement date.[30] In this basic model, we use the unrestricted definition of the four-quarter structure. Therefore, the 4-Qtr. structure variable in Equation 5.2.1 takes the value of one at time t if the dividend increase announcement follows four quarters after the latest announcement and zero otherwise. The coefficient thus measures the effect of following the four-quarter structure on the CAR.

Abnormal returns are calculated via standard event study methodology. We estimate a market model by regressing the return for stock i on a constant and the return on a market portfolio (Brooks, 2014). The market model is exhibited in equation 5.2.2.

$$R_{it} = \delta_i + \varphi_i * R_{mt} + \mu_{it} \qquad \text{(Equation 5.2.2)}$$

As Andres and Hofbaur (2017), we use an estimation window comprising days -200 to -21 prior to the event date t to estimate the parameters in the model. We use the CRSP value-weighted return as a benchmark for the market portfolio, $R_{mt}$. We then use the model to generate a predicted return for each observation in our sample. Having calculated the predicted return, we subtract it from the realized return to get the abnormal return for the event date (Brooks, 2014). The firm's abnormal return is the differences between the realized return and the return it could be expected to earn at that event date. In an event study, we therefore see the effect of the event on the abnormal return of the firm. We are able to retrieve enough estimation- and event window days for 28,724 observations, which thus constitutes our sample of dividend increase announcements.

[30] The event window thus comprises days t-1,t and t+1.

Equation 5.2.1 is a univariate regression model, and we apply this as a first step in our event study analysis. As several factors might affect the announcement return, we further analyze the effect of the four-quarter structure in a multivariate regression model. In the following analysis, we therefore expand equation 5.2.1 by a vector of controls variables, $X_{it}$, comprising dividend payout-and firm characteristics. As we make various regression specifications, the variables included in the vector depends on the specification in the table, which we further specify in the analysis. Equation 5.2.3 shows the multivariate regression model.

$$CAR_{it}\,[-1,1] = \alpha_2 + \beta_2 * 4 - Qtr.\ structure_{it} + \gamma_1 X_{it} + \eta_{it} \qquad \text{(Equation 5.2.3)}$$

As a final test of Hypothesis 1, we analyze the effect of deviations from the four-quarter structure. We hypothesize that when a dividend announcement follows a four-quarter structure, it should lead to a lower return for the stock on the announcement, since these dividends are predictable. Therefore, deviations from the structure should be a surprise to investors, and lead to a higher announcement return than other dividends. We thus test whether announcement returns are different for dividend increases that deviate from the four-quarter structure. The variable, Interim increase, is equal to one if the firm makes its current announcement within three quarters after its most recent announcement, after having followed the four-quarter structure. The current increase announcement then occurs before the next increase is expected, and this is what surprises investors. This is expressed in equation 5.2.4, which is equivalent to 5.2.3 except that the Interim increase variable replaces the four-quarter structure variable:

$$CAR_{it}\,[-1,1] = \alpha_3 + \beta_3 * Interim\ \ increase_{it} + \gamma_2 X_{it} + \nu_{it} \qquad \text{(Equation 5.2.4)}$$

## 5.3. Method for Testing Hypotheses 2.i to 2.vii

Hypotheses 2.i to 2.vii analyze the probability of following a four-quarter structure, and to analyze these hypotheses we apply a logit regression model.[31] The disadvantage of our logit regression model is that the interpretation of the marginal effect depends on the level of the

[31] Previous analysis uses a probit regression, but as the logit and probit models are highly similar (Stock & Watson, 2015), we should get similar results. We apply a logit framework as opposed to a linear probability model, as the logit framework forces the dependent variable to take a value between zero and one. This prevents the occasion in which the dependent variable exceeds one and thus implies a probability of more than 100%.

variable. We compensate for this by calculating the marginal effects of our coefficients at the means, to provide some evidence of the economic effects of changes in our variables.

It is important to clarify how we use the variable that measures four-quarter structure in this logit analysis, as this differs from how we use it in the OLS analysis. Whereas the indicator variable 4-Qtr. structure is the main explanatory variable in the event study, it becomes the dependent variable in our test of Hypotheses 2.i to 2.vii. The different ways of using the variable reflects the different perspectives of analysis in the two settings. In the event study analysis, we analyze whether investors react to firms' use of the four-quarter structure, and the variable thus indicates what investors know at time *t* about the firms' previous decisions. In this analysis of the probability of adoption, the variable measures whether the firm adopts the four-quarter structure. The variable thus proxies for the firm's decision, and we call the dependent variable Adoption in this analysis.

There is also an important difference in terms of the timing of measuring four-quarter adoption. In the OLS analysis, standing at time t, the 4-Qtr. structure variable measures whether the firm has increased its dividends exactly four quarters *before* time t, at t-4Q. In this logit analysis, to be consistent with Andres and Hofbaur (2017), the dependent variable Adoption takes the value of one if the firm increases its dividend exactly four quarters *after* time t, at t+4Q.[32] As all observations are dividend increases at t, so in this analysis a subsequent increase in t+4Q indicates that the firm has followed the four-quarter structure. The dependent variable therefore proxies for the firm's decision at time t about whether to follow the four-quarter structure. Under this assumption, the model predicts which firms will follow the four-quarter structure at time t+4Q, implicitly assuming they make the decision at t.[33]

[32] As suggested by Andres and Hofbaur (2017), one could also use the contemporaneous indication of four-quarter adoption as in the OLS analysis. However, to make the results comparable to previous findings, we apply this forward-looking version.

[33] Basically, for each observation we look at whether the 4-Qtr. structure variable at time t+4Q takes the value of one.

Having clarified the measurement of four-quarter structure in this logit analyses, we proceed by explaining the model we apply to test Hypotheses 2.i to 2.vii, as illustrated by equation 5.3.1.

$$Pr(Adoption_{it} = 1|Z_{it}) = F(\alpha_4 + \beta_4 Z_{it}) \qquad \text{(Equation 5.3.1)}$$

The dependent variable $Adoption_{it}$ takes the value of one if the firm increases its dividend in t and t+4Q, and zero otherwise. $Z_{it}$ is a vector of firm characteristics, including the variables presented in Hypotheses 2.i to 2.vii as well as control variables. We thus measure the effect of these firm characteristics on the probability of adopting the four-quarter structure. The firm characteristic variables included in the equation vary according to the specification in the regression table, and in the analysis section we explain how we build up the regression tables in terms of adding the variables. We further make some sample restrictions relative to the sample we use in the study of announcement effects. As the dependent variable measures whether the firm follows the four-quarter structure in t+4Q, we remove all the last firm-quarter observations. The last firm-quarter observation will always return a value of zero, as there is no information on the observation four-quarters ahead.

When testing Hypothesis 1 and Hypotheses 2.i to 2.vii, we employ industry, firm and time fixed-effects, to account for heterogeneity across these dimensions (Gormley & Matsa, 2014). We control for industry fixed effects in most of our regressions, as this capture differences between the industries that could affect the likelihood of four-quarter adoption.[34] Moreover, we control for announcement year- and quarter as time fixed-effects. Introducing time fixed-effects to the regression models allows us to eliminate the impact of omitted variable bias arising from not including time varying variables that affect all firms equally (Stock & Watson, 2015).[35]

[34] For instance, pharmaceutical companies might be inherently less likely to increase dividends than car manufacturers, say, for reasons of reinvestment needs for R&D. Then, ignoring the effect of being in the pharmaceutical industry would induce an omitted variable bias.

[35] An example of such a variable is the federal tax rates on dividends. It generally affects the attractiveness of paying dividends, for instance relative to repurchases (Berk & DeMarzo, 2014). Changes to the federal tax rate for corporations will affect all industries equally, but it will vary over time.

## 5.4. Method for Testing Hypothesis 3

Hypothesis 3 states that the probability of adopting the four-quarter structure is positively affected by the share of peers who adopt the structure. To test for the effect of peer adoptions, we augment equation 5.3.1 with a variable that measures the share of peers following the four-quarter structure. In the following, we explain our baseline model for testing Hypothesis 3.

We define a peer group as the firms who belong to the same three-digit SIC code, in line with previous literature (Leary & Roberts, 2014). It is important to be able to justify that the members of the peer group are peers. Otherwise, it is difficult to argue that the peers can use each other's decisions as information (Manski, 1993).[36] We measure peer adoption before time t, as the decision-making by the firm and its peers cannot overlap in time (Kaustia & Rantala, 2015). Specifically, we measure peer adoptions in the four quarters prior to time t.[37] This implies that the firm can observe past decisions by peers at time t and use this information in its decision on whether to follow the four-quarter structure. When we measure peers' adoption of the four-quarter structure, we look at whether the 4-Qtr. structure variable for the peers takes the value of one.[38] We call our major explanatory peer adoption variable the Peer Ratio. The calculation of this variable is illustrated in Equation 5.4.1.

$$Peer\ Ratio_{it} = \frac{\sum 4\text{−Qtr. structure}_{-i,jt}}{\sum Dividend\ increase_{-i,jt}} \qquad \text{(Equation 5.4.1)}$$

In Equation 5.4.1[39], the numerator measures total number of *four-quarter dividend increases* by the firm's peers. The denominator measures the total number of *dividend increases* by the firm's peers. This gives the ratio of dividend-increasing peers that follow the four-quarter structure. As mentioned, we measure the Peer Ratio in the four quarters before time t. This is

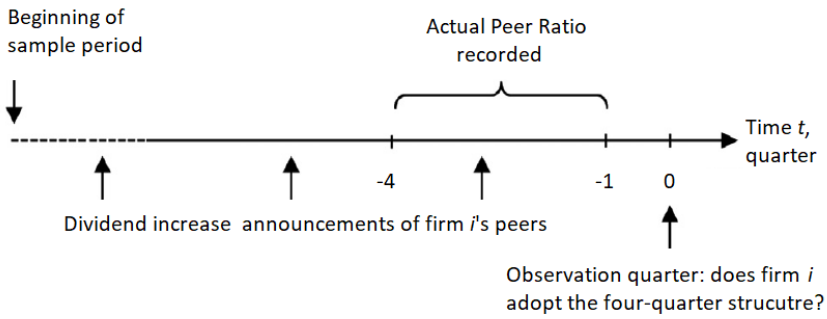
[36] In section 6.4, we test the sensitivity of our results to alternative peer group definitions. Furthermore, in the discussion in section 6.4 we assess our choice of method in relation to alternatives.
[37] Hence, if time t is Q2 2010, the ratio of four-quarter increases over total increases for peers is measured from Q2 2009 up until and including Q1 2010.
[38] Therefore, peers have followed the structure when they make a dividend increase that follows four quarters after the most recent dividend increase, accordingly with the definition of the 4-Qtr. structure variable.
[39] As for the subscripts in Equation 5.4.1, the quarter is denoted by t. The three-digit SIC code, which represents the peer group, is denoted by j. Importantly, the notation –i in Equation 5.4.1 indicates that we exclude firm i from the peer group in calculating the ratio.

illustrated in Figure 5.4.1.[40] Standing at time t, the firm can thereby observe the share of its peers that have followed the four-quarter structure in the previous four quarters. To test for the effect of peer adoptions on the probability of firm adoptions, we add the Peer Ratio to Equation 5.3.1.

$$Pr(Adoption_{it} = 1|Peer\ Ratio_{it}, Z_{it}) = F(\alpha_5 + \theta_1 * Peer\ Ratio_{it} + \beta_5 Z_{it}) \quad \text{(Equation 5.4.2)}$$

Equation 5.4.2 is similar to Equation 5.3.1 except for the inclusion of the Peer Ratio, and $Z_{it}$ therefore includes the same variables as in Equation 5.3.1. Hence, we want to test for the presence of peer effects, controlling for the factors already known to affect the likelihood of four-quarter adoption (Andres and Hofbaur, 2017). This is our baseline regression model for Hypothesis 3.

**Figure 5.4.1**
Illustration of the Timing of Measuring the Peer Ratio relative to Time t.
As illustrated in the figure, we measure the ratio of peers who follow the four-quarter structure in the four quarters prior to time t. We consider only the dividend increase announcements four quarters prior to time t in the calculation of the Peer Ratio. This implies that the firm is standing at time t, observing whether peers have adopted the four-quarter structure within the most recent four quarters.




Furthermore, we develop an alternative measure of peer adoption, which we call Peer Dummy. There is significant variation in the size of peer groups when defining peer groups according to different SIC codes (Kaustia & Rantala, 2015). Large peer groups are, all else equal, more likely to have firms that adopt the four-quarter structure. The Peer Dummy takes the value of one if adoption activity in the peer groups is higher than the adoption activity of the market in general, and zero if it is not higher than market adoption activity. The market

[40] The Peer Ratio at time t aggregates the ratio of peer adoptions of the four-quarter structure over quarters t-4Q to t-1Q.

refers to all observations in the sample, and we measure the market adoption activity by the Market Adoption Ratio, which is illustrated by Equation 5.4.3.

$$Market\ Adoption\ Ratio_t = \frac{\sum 4\text{–Qtr. structure}_t}{\sum Dividend\ increases_t} \qquad \text{(Equation 5.4.3)}$$

The numerator in Equation 5.4.3 measures total number of *four-quarter dividend increases* in the market. The denominator measures the total number of *dividend increases* in the market. This gives the ratio of dividend-increasing firms that follow the four-quarter structure. As with the Peer Ratio, we measure this ratio over the four quarters prior to time t. The Peer Dummy takes the value of one if the Peer Ratio exceeds the Market Adoption Ratio, and zero otherwise. With this measure of four-quarter adoption by peers, we simply observe whether there is a higher than average tendency for peers to follow the four-quarter structure in the period. We use the Peer Dummy in section 6.4.1 to describe the relation between peer adoption and firm adoption as well as in a robustness test in section 6.4.2. Equation 5.4.4. Illustrates the regression model when the Peer Dummy substitutes for the Peer Ratio.

$$Pr(Adoption_{it} = 1|Peer\ Dummy_{it}, Z_{it}) = F(\alpha_6 + \theta_2 * Peer\ Dummy_{it} + \beta_6 Z_{it})$$

(Equation 5.4.4)

We proceed by explaining the methods we apply as robustness tests to account for typical endogeneity problems that occur when measuring peer effects. As explained in section 3.2, a threat to the validity of our results is the possibility that common factors in the peer group affect the likelihood of four-quarter adoption. We address this in our last robustness tests of Hypothesis 3 in sections 6.4.9 and 6.4.10. In the following, we explain the rationale behind these tests as well as how we make them. Firstly, we control for historic group-level persistence to follow the four-quarter structure. If peers generally tend to follow the four-quarter structure extensively, the firm might not infer much new information from recent adoptions. In that case, increases in the Peer Ratio should not affect the probability of adoption. To measure the past tendency to follow the four-quarter structure, we create two "history" variables, which measure the ratio of peer adoptions of the four-quarter structure back in time. Firstly, we create a variable called Peers' 5-year History. We construct the variable by counting the four-quarter adoptions by peer firms during a rolling time-period of the past five years, divided by the number of dividend increases in this period. The recent four quarters are excluded, so the new variable does not overlap with the recent peer adoption activity

measured by the Peer Ratio.[41] In addition, we add a control variable that measures the 10-year history of adoptions, and label it Peers' 10-year History.[42] This variable is identical to Peers' 5-year History in terms of measurement, except that it measures the ratio of peer adoptions of the four-quarter structure over a ten-year period.

We further control for common factors to the peer group by including industry fixed-effects. Ideally, we want to control for each specific peer group, to test if there are group-specific factors that affect the probability of adoption. As we use the three-digit SIC codes to define the peer groups, the natural choice would be to use the three-digit SIC codes as fixed-effects. However, if we use three-digit SIC codes, we have a problem with a lack of variation between the fixed-effects and the measure of peer adoption for some of the groups. For instance, in the three-digit SIC codes 149 and 396, there is perfect multicollinearity between the Peer Ratio and the industry fixed-effect. In every observation of these SIC codes, the Peer Ratio has a value of one, and since the SIC code fixed-effect takes the value of one, there is no variation between the respective variable observations. In general, there is a high collinearity between our major explanatory variable and the three-digit SIC code if we use this SIC code as fixed-effects. The same problem arises when we use the Peer Dummy as an alternative measure of peer adoption. As the Peer Dummy takes the value of one in many observations, there will also be a lack of variation relative to the fixed-effect, so using the Peer Dummy does not mitigate the problem. Therefore, we need to rely on other industry classifications such as the two-digit SIC code in our robustness tests related to endogeneity threats.

As mentioned, we address the threat of endogeneity in a separate section as our last robustness test of Hypothesis 3. In our study, the peer group is defined based on an industry classification, and therefore we use industry classifications to address endogeneity concerns. This means that industry fixed-effects are not part of the analysis of Hypothesis 3 until the tests for peer group-specific effects (Kaustia & Rantala, 2015). The analysis of Hypotheses 2.i to 2.vii that we try to build on do account for industry fixed-effects. Hence, as our first analyses of

[41] Peers' 5-year History variables are calculated from observations during quarter $t_{-20}$ to $t_{-5}$.
[42] Peers' 10-year History variables are calculated from observations during quarter $t_{-40}$ to $t_{-5}$

Hypothesis 3 do not include industry fixed-effects, the result of these are not directly comparable to the results of Hypotheses 2.i to 2.vii. However, we account for industry fixed-effects in the endogeneity robustness tests for Hypothesis 3, and this facilitates a comparison with Hypotheses 2.i to 2.vii.

## 5.5. Method for Testing Hypothesis 4

Hypothesis 4 states that following a four-quarter structure should be associated with higher dividend smoothing. We measure dividend smoothing by the speed of adjustment (SOA) to a firm's target level of dividends. SOA measures the speed by which the firm closes the gap between its current- and target dividend levels (Leary and Michaely, 2011). To measure this, we regress the change in dividends on a variable called dev. The variable dev measures the deviation from target dividend level. As the variable dev increases, the firm closes the gap between the current- and target dividend level faster. This is because the dev variable captures the effect of the deviation from the target on the change in dividends. Essentially, the larger the impact of the deviation from target on the firm's change to dividends, the more the firm responds to deviations from the target level of dividends. Hence, the faster the firm wants to reach the equilibrium level, the more it responds to deviation from this equilibrium level. The corresponding coefficient on dev thus denotes SOA. To analyze the association between the four-quarter structure and dividend smoothing, we include the Post-4QRS$_{it}$ variable. This implies that we use the post-adoption definition of the four-quarter structure, to account for whether the firm has previously followed the structure. We expect to see a lower SOA, and thereby an increased dividend smoothing, for firms that have followed the four-quarter structure. The model is formulated in Equation 5.5.1:

$$\Delta D_{it} = \alpha_7 + (\beta_7 + \varrho \cdot Post4QRS_{it}) \cdot dev_{it} + \xi \cdot Post4QRS_{it} + \vartheta \kappa_{it} + \lambda_{it} \qquad \text{(Equation 5.5.1)}$$

Where the dev is the deviation from the target dividend level. The variable dev is defined as the target dividend ratio times the earnings per share less the dividends per share paid during the prior year. The target payout ratio is defined as the median dividend-payout ratio of firm i. The variable $\kappa_{it}$ is a vector of controls for time tendencies and interaction terms which we will later specify. We expect the coefficient on $\varrho$ to be negative, which reflects a slower speed of adjustment for firms following the four-quarter structure.

# 6. Analysis

This chapter tests the hypotheses derived in chapter 3 and discusses the implications of the results. Before testing the hypotheses, we investigate the data descriptively to verify the existence of a four-quarter structure in the pattern of dividend increases. All our hypotheses concern the four-quarter structure in dividends, so we consider it important firstly assure that this tendency is evident in our data.

## 6.1. Descriptive Statistics on the Four-quarter Structure

This section sets precedent for the subsequent tests of Hypotheses 1 to 4 by verifying the four-quarter structure in dividend increases. Andres and Hofbaur (2017) demonstrate that dividend-increasing firms tend to follow a four-quarter structure. Consistent with Andres and Hofbaur (2017), we commence by analyzing dividend changes in general to show that the structure is especially prevalent for dividend increases. Among the changing dividends in our sample, we focus only on increases and decreases to dividends, as these are the major components, and henceforth refer to these as dividend changes.

Table 6.1.1 divides the sample of dividend changes into four groups, based on the time between their current and most recent dividend change.[43] The table shows how 38.3% of firms change their dividends fewer than four quarters after their previous change, while 32.7% change their dividends exactly four-quarters after their most recent change. In total, 71% of the sample change dividends within a year of their previous change. This is even higher than the corresponding percentage of 59.2% in Andres and Hofbaur (2017), and thus gives a first indication of a tendency in the structure of dividend changes.

[43] The total increases and decreases in dividends are 42,800, but as we measure the time since their most recent increase, the first firm-quarter observations drop out of the subsample. The number of observations remaining is 38,214, where there are 4,586 different firms.

**Table 6.1.1**
Patterns in Dividend Changes
This table displays the distribution of the time between two consecutive dividend changes by number of observations and total number of firms in the sample. The total number of firms differs from the total number of observations in our sample (5772), as some firms in the sample never change their dividends.

| | Observations | | Firms | |
|---|---|---|---|---|
| Time between two consecutive dividend changes | N | Fraction | N | Fraction |
| Fewer than four quarters | 14,640 | 38.3% | 2,895 | 63.1% |
| Exactly four quarters | 12,507 | 32.7% | 2,448 | 53.4% |
| More than four and fewer than mine quarters | 3,894 | 10.2% | 1,882 | 41.0% |
| More than eight quarter | 7,173 | 18.8% | 2,608 | 56.9% |
| Total | 38,214 | 100.0% | 4,586 | 100.0% |

In Table 6.1.2, we further examine the structure of dividend changes to verify the existence of a four-quarter structure. Panel A of Table 6.1.2 shows the pooled distribution of the entire sample of dividend payments for the different types of dividends, including the magnitude of the dividend changes on average for each type. In Panel B, we look at the development over time for dividends that decreases at time t. In Panel C we do the same for dividend increases. For example, in the central column in Panel B, column t, the 100% in the row labeled "Decreases" indicates that all these dividends decreased at time t. Therefore, all other rows of change types in this column are zero. Looking at the left-hand side of the table before column t, the columns show what the firms who made decreases at time t did with their dividends in the eight, four, three, two and one quarters prior to time t. Equivalently, the columns after t show how these dividends change in the quarters after time t. For example, for the dividends that decreased at time t, only 2.85% also decreased at time t-1Q, while up to 60.42% remained stable. Panel C has the same structure, showing how the dividend increases at time t develop before and after this time-period.

In Panel B, we see how there seems to be a higher propensity to decrease dividends in the four- and eight quarters before and after time t, relative to the interim quarters. The percentage of dividend decreases in time t-4Q and t+4Q are around seven percent, which is higher than the fraction of the pooled distribution of dividend decreases (3.27%). The same goes for times t-8Q and t+8Q, which also reach a level of around seven percent. The table thus shows that there is a higher tendency for dividends decreases to decline in the four- and eight

quarters before and after time t than in the interim quarters. However, we see only modest signs at best of a four-quarter structure, as dividends that decrease at t are predominantly stable in the quarters before and after time t.

While the signs of a four-quarter structure in dividend decreases were modest, there is a stronger indication of such a structure in dividend increases. It is evident that most dividends that increased in time t were stable in the three quarters before and after time t. In these interim quarters, the percentages which increased within this time-period reaches around 11% at a maximum, which is the same level as the pooled distribution. When looking at the eight and four quarters before and after time t, however, the percentage of increases is much higher than the pooled distribution. For example, in time t+4Q the percentage of dividends that increase again exactly four quarters after time t is 47.45%. In this panel, we thus see signs of a four-quarter structure in dividend increases.

Table 6.1.2 thus supports the findings by Andres and Hofbaur (2017) that there is a four-quarter structure in dividend increases. Our percentages of respectively dividend decreases and increases closely resemble their findings. While these authors further add a t-statistic of the equality of proportions between the time specific fractions and the pooled distributions, we believe it suffices for our purposes at this stage to find that the proportions are similar to those in Andres and Hofbaur (2017).

**Table 6.1.2**

Serial Structure of Quarterly Dividend Changes.

This table describes quarterly dividend changes over as many as eight quarters before and after a dividend announcement conditional on the dividend change of a firm in period t. "Omissions" denote dividend omissions, "Decrease" refers to a reduction in quarterly dividends, "Stable" ("Increase") refers to maintained (increased) dividends, and "Initiations" indicate dividend initiations and dividend resumptions. Panel A summarizes dividend changes for the pooled sample. Panel B describes the dividend policy of firms that cut their dividends in period t. Panel C describes the dividend policy of firms that increase their dividend payments in period t.

Panel A: Pooled Distribution of Dividend Changes

| | Fraction | N | Div. chg. % |
|---|---|---|---|
| Omissions | 0.81% | 2,417 | -100.00% |
| Decrease | 3.27% | 9,705 | -41.72% |
| Stable | 82.00% | 243,298 | 0.00% |
| Increase | 11.15% | 33,095 | 27.55% |
| Initiations | 2.75% | 8,126 | 0.00% |
| N | 100.00% | 296,641 | |

| | t - 8Q | t - 4Q | t - 3Q | t - 2Q | t - 1Q | t | t + 1Q | t + 2Q | t + 3Q | t + 4Q | t + 8Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Panel B: dividend decreases | | | | | | | | | | | |
| Omissions | | | | | | 0.00% | 0.00% | 0.00% | 2.66% | 1.80% | 0.66% |
| Decrease | 7.18% | 7.00% | 3.29% | 3.15% | 2.85% | 100.00% | 2.94% | 3.33% | 3.46% | 7.30% | 7.62% |
| Stable | 77.78% | 77.86% | 82.87% | 83.61% | 60.42% | 0.00% | 87.57% | 84.67% | 73.10% | 76.08% | 78.55% |
| Increase | 12.13% | 12.53% | 11.66% | 10.97% | 34.06% | 0.00% | 9.49% | 12.00% | 20.68% | 12.81% | 12.54% |
| Initiations | 2.64% | 2.45% | 2.00% | 2.22% | 2.67% | 0.00% | | | | | |
| Div. chg. | 1.49% | 2.03% | 3.52% | 4.19% | 19.00% | -41.72% | 2.82% | 2.59% | 5.97% | 1.54% | 0.56% |
| N | 8,159 | 8,963 | 9,118 | 9,284 | 9,390 | 9,705 | 9,117 | 8,775 | 8,669 | 8,588 | 7,687 |
| Panel C: dividend increases | | | | | | | | | | | |
| Omissions | | | | | | 0.00% | 0.00% | 0.00% | 0.42% | 0.23% | 0.28% |
| Decrease | 3.45% | 3.58% | 5.70% | 3.27% | 2.66% | 0.00% | 9.95% | 3.21% | 3.40% | 3.66% | 3.49% |
| Stable | 51.43% | 45.27% | 80.50% | 83.63% | 90.86% | 0.00% | 85.20% | 85.80% | 85.00% | 48.61% | 54.81% |
| Increase | 42.00% | 47.47% | 11.08% | 10.85% | 4.80% | 100.00% | 4.85% | 10.99% | 11.16% | 47.45% | 41.32% |
| Initiations | 2.87% | 3.55% | 2.63% | 2.21% | 1.68% | 0.00% | | | | | |
| Div. chg. | 7.92% | 9.10% | 1.14% | 1.62% | 0.01% | 27.55% | -2.73% | 17.39% | 1.45% | 7.09% | 0.56% |
| N | 27,902 | 30,963 | 31,464 | 32,159 | 32,506 | 33,095 | 32,139 | 31,745 | 31,237 | 30,703 | 28,362 |

We find that the four-quarter structure is mostly evident for dividend increases, so we continue with only this type of dividend change. In Table 6.1.3, we look at the propensity to follow a four-quarter structure in dividend increases. We measure this as the fraction of dividend increases that follow exactly four quarters after the most recent increase out of all the dividend increases. We split the result for this fraction into different combinations of fiscal years- and quarters. This is to see whether the four-quarter structure prevails at certain times of the year. For example, the top left corner of the table is the fraction of four-quarter

increases for observations in the first quarter of the fiscal year, for those firms where the fiscal year ends in quarter one. Likewise, moving one cell to the right we see the corresponding fraction for observations in the second quarter, for those firms where the fiscal quarter ends in quarter one. Across all different fiscal year-end and fiscal quarters, there seems to be a larger tendency for these four-quarter increases to be announced in the beginning of the year. However, like Andres and Hofbaur (2017) find, the wedge between the highest and lowest fractions (49.59%-36.38%) is only 13.19%, indicating that these four-quarter announcements occur across all quarters of the fiscal year.

**Table 6.1.3**

Four-quarter Structure and Fiscal Quarters.
This table displays the results of the propensity to adopt the four-quarter structure in dividend increases by fiscal-year-end/fiscal-quarter combinations. The percentage values given below denote the fraction of dividend increases that are part of a four-quarter sequence over all dividend increases announced in the corresponding fiscal quarter/fiscal-year-end combination.

| Quarter in which fiscal year ends | Fraction of four-quarter increases by fiscal quarter | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | # of div. Increases |
| 1 | 45.14% | 47.68% | 26.37% | 29.72% | 2,187 |
| 2 | 42.98% | 53.01% | 40.69% | 33.40% | 2,678 |
| 3 | 51.56% | 50.95% | 33.41% | 30.94% | 2,219 |
| 4 | 51.17% | 44.46% | 38.33% | 38.37% | 13,533 |
| All | 49.57% | 47.00% | 37.10% | 36.38% | 20,617 |

Having determined the prevalence of the use of four-quarter structures in dividend increases, we further investigate how this has developed over time. In Figure 6.1.1, we therefore plot the yearly development in the ratio of four-quarter increases over all dividend increases. All ratios are five-year moving averages. The graph label “All Firms” shows that the four-quarter structure has gained momentum in recent decades, increasing from 20% in 1976 to 55% in 2016. One reason for the observed increase in the ratio of four-quarter increases could be that the total number of increases is declining. We know that the propensity to pay dividends has decreased since the 1970s (Fama & French, Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay?, 2001), so it could be that firms that are not using the structure drop out while the number of four-quarter increases remains unchanged. This would increase the ratio of four-quarter increases because fewer firms pay dividends, and not because more firms chose to follow the structure.

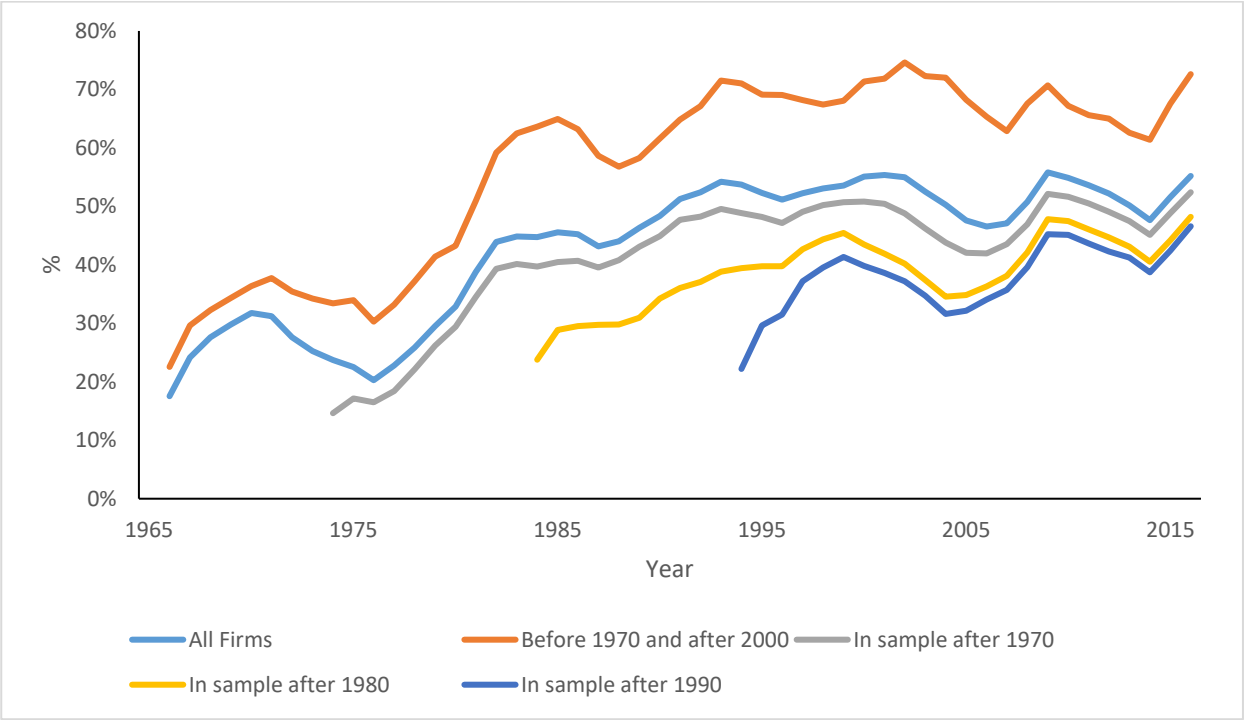
Furthermore, the ratio might also be driven by the entrance of new firms which follow the four-quarter structure in dividend increases. In this way, the increase in the ratio might reflect the increasing weight of new firms in the sample rather than a change in existing firms' policy. There have been two major modifications to the population of dividend paying firms, due to the inclusion of new stock exchanges into CRSP.[44] Therefore, the increasing four-quarter ratio may reflect that a substantial amount of new companies entered at these times. To address this possibility, we plot decade-specific graphs as well in Figure 6.1.1.

We divide the observations into four different subgroups for which we plot graphs in Figure 6.1.1: (i) firms that first appear in CRSP as dividend payers before 1970 and remain there until after 2000; (ii) firms that enter CRSP after 1970; (iii) firms that enter CRSP after 1980; and (iv) firms that enter CRSP after 1990. If the time trend were caused by new entries into CRSP, the lines should be subject to different levels. If new entries were driving the results, the 1970s, 1980s and 1990s firms should be more likely to follow the structure. Nonetheless, Figure 6.1.1 shows that the propensity to follow the four-quarter structure is increasing in all subgroups, so this suggests that sample attrition does not explain the results. If anything, graphs seem to indicate the opposite. Hence, it seems plausible that the increasing tendency in the structure reflects that existing firms in the sample are changing their policy towards using the four-quarter structure. In summary, we find similar result as in Andres and Hofbaur (2017), that changes in the sample population do not provide convincing explanation for the documented time trend in the four-quarter structure.

[44] Firstly, AMEX-listed companies were included to the data in 1963, and in 1973 NASDAQ-listed firms entered as well (Fama & French, Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay?, 2001).

**Figure 6.1.1**

The Four-quarter Reference Structure over Time. This figure displays the dividend increases subject to the four-quarter structure (5-year moving average) as a percentage of all dividend increases within a year for the period 1965 to 2015




## 6.2. Analysis of Hypothesis 1

In the previous section, we supported the finding that there is a tendency of following a four-quarter structure in dividend increases. Firms seem to peg their decision on whether to announce dividend increases to the decision made exactly four-quarters ago. In this section, we test Hypothesis 1 on the effect of this structure on the stock return at dividend announcement. Firstly, we run a univariate event study analysis, to determine whether there is a statistically significant difference between announcements that follow a four-quarter structure and other announcements. Thereafter, we conduct a multivariate event study, to determine whether a potential effect of following a four-quarter structure persists when controlling for dividend- and firm characteristics. We firstly test Hypothesis 1 using an approach equivalent to Andres and Hofbaur (2017), and thereafter we challenge their findings by using an alternative definition of the four-quarter structure.

### 6.2.1. Event Study Analysis with the Unrestricted Definition of a Four-quarter Structure

In Table 6.2.1, we test Hypothesis 1 in a univariate setting. As shown in the descriptive section, the four-quarter structure is observable to the market, so we expect that investors incorporate this knowledge into their reaction to the dividend increase. To test this, we divide the subsample of dividend increases into two groups: i) observations where the 4-Qtr. structure variable is zero, and ii) observations where the indicator variable is equal to one. We then apply Equation 5.2.1 for each group, expecting that the CAR is significantly higher for the first group given the predictability of the increases in the second group.

The results in Table 6.2.1 support Hypothesis 1, as the average CAR is higher when firms do not follow the four-quarter structure (1.34%) compared to when they do (0.74%). The delta of 0.60% is statistically significant at the one percent level.[45]

**Table 6.2.1**

Dividend Structure and Announcement Returns – Univariate Results.
This table displays cumulative abnormal returns upon dividend increase announcements during the event window from one day before the dividend announcement to one day after the dividend announcement. Delta denotes the difference in mean between the two "4-Qtr. structure" groups; t-stat and p-value correspond to a t-test for equality-of-means and of the two "4-Qtr Structure" groups.

| Window | 4-Qtr Structure = 0 | 4-Qtr Structure = 1 | Delta | T-stat | p-Value |
|---|---|---|---|---|---|
| CAR [-1;1] | 1.34% | 0.74% | 0.60% | 11.65 | 0.00% |
| N | 16,713 | 12,011 | | | |

While the findings in Table 6.2.1 provide preliminary support for Hypothesis 1, we further test it in a multivariate setting in Table 6.2.2. Using Equation 5.2.3, we gradually expand the basic event study regression in Equation 5.2.1 with control variables, to see if the results from Table 6.2.1 are robust when accounting for dividend- and firm characteristics. In specification (1), we control for payout characteristics by including the relative dividend increase and the dividend yield. In specification (2), we replace the indicator variable 4-Qtr. structure with a

[45] In untabulated results, we demonstrate that the announcements effect of dividend increases for all observations leads to a positive CAR of 1.09%, which is significant at the one percent level. This supports the widely documented findings that investors react positively to announcements of dividend increases (Amihud & Li, 2006; Aharony & Swary, 1980)

variable that measures the persistence of the four-quarter structure.[46] Like the 4-Qtr. structure variable, it should negatively affect the announcement return. The longer the firm has followed the four-quarter structure, the more predictable the increase should be. In specification (3), we include both measures of four-quarter adoption, and the coefficient on the # 4-Qtr. structure variable thus represents the interaction term of the two variables.

In specification (4), we further control for firm characteristics that are likely to affect the announcement effect. The variable for contemporary earnings announcements is included to control for the partial effect of news about earnings. This enables us to disentangle the information content from the dividend increase from that of the earnings announcement. We further control for the firm's MTB, change in earnings, size and the return on assets. These characteristics could affect the CAR in different ways, depending on how investors perceive their effect on the dividend increase. On the one hand, good financial performance could contribute to increase CAR, as investors are more confident in the information content of the dividend increase announcement. On the other hand, the news of a dividend increases might well be less surprising when they follow from an already well-performing firm, and thereby have a negative impact on the abnormal return. In specification (5), we include illiquidity,[47] which should positively affect stock returns (Amihud, 2002).

To account for the possibility of unobserved heterogeneity, we use various fixed-effects in Table 6.2.2. This is to alleviate the concern that the 4-Qtr. structure variable proxies for unobserved industry tendencies or firm-specific aspects such as strategy and management. In specifications (1) to (5), we employ firm fixed-effects as our entity fixed-effect, and in specifications (6) to (8) we replace the industry fixed-effects by firm fixed-effects. Specification (6) is thus equal to specification (5) except that firm fixed-effects substitutes for industry fixed-effects. In specifications (7) and (8), we replace the 4-Qtr. structure variable with the Interim increase variable, which takes the value of one if the dividend increase announcement deviates from the four-quarter structure. As discussed in the methodology section, we expect

[46] The variable #4-Qtr. structure measures the number of past consecutive dividend increases that the firm has made according to the four-quarter structure

[47] Illiquidity is the average of the daily ratio of absolute stock return to dollar volume (Amihud, 2002).

deviations from the four-quarter structure to cause a positive reaction in the stock market. Given that the market anticipates dividend increases that follows the four-quarter structure, investors should perceive increases that deviate from the structure to be conveying new information. Thus, we expect the Interim increase variable to positively affect the CAR. In specification (7), we use all observations, but in specification (8) we use only the dividend increases that at some point are part of the four-quarter structure. Thereby, we test whether the results for Interim increase announcements are different in a more restricted sample.

In Table 6.2.2, we see the result of this multivariate event study analysis, where we measure CAR over the event window [- 1 ;+ 1]. In model specification (1), the coefficient for the 4-Qtr. structure variable is negative and statistically significant at the one percent level when controlling for the dividend-related characteristics. Dividend increases that are part of the four-quarter structure thus still appear to be more anticipated, and lead to significantly lower announcement returns than other increases. The coefficient on #4-Qtr. structure in specification (2) further supports this, as it is negative and significant at the one percent level. In model specification (3), the 4-Qtr. structure variable is still negative and sig-nificant at the one percent level. The negative and significant coefficient for #4-Qtr. structure shows that the longer firms have followed this policy, the more investors anticipate it, and the lower is the announ-cement return. In model specifications (4) to (6), the 4-Qtr. structure variable remains negative and sig-nificant at the one percent level despite the inclusion of control variables. In specification (7) and (8), we see that the coefficient on Interim increase is significantly positive at the one percent level for both sam-ple selections. The results suggest that deviations from the structure are associated with significantly higher announcement returns. Also, the results are insensitive to the choice of entity fixed-effects.

For the dividend characteristics, we see that the relative dividend increase is insignificant in all specifications. However, the coefficient on Div. yield is positive and significant in all specifi-cations except (5), so the dividend yield seems to have a positive impact on the announcement date return. Contemporary earnings announcements, which we control for in specifications (4) through (8), is consistently insignificant. The change in earnings, measured by D.ROA, is insignificant in all specifications except when initially included in (4). MTB and LVG are insig-nificant in all specifications, whereas IllIQ is insignificant in all specification except (5). The coefficient on Size is consistently negative and significant throughout Table 6.2.2, although it

becomes insignificant in specification (8). ROA, measuring the profitability of the firm, it is positive and significant in all specifications except (8). Hence, most evidence support that Div. yield, Size and ROA affect the announcement return. Only exceptions are the restricted sample in specification (8), where Size and ROA are insignificant, and specification (5) where the dividend yield is insignificant.

The results of Table 6.2.2 show support for the findings by Andres and Hofbaur (2017) in two ways. Firstly, the market anticipates increases in dividends for firms that follow a four-quarter structure. Dividend increases which are part of the four-quarter structure are associated with lower returns at the announcement date, since these dividends are more predictable than other dividends. Secondly, deviation from the four-quarter structure is associated with a significantly higher announcement return than other increase announcements. The market sees this as a surprise, meaning that this dividend increase conveys more information than those that followed a predictable pattern *and* other dividend increases. In conclusion, the results of Table 6.2.1 and Table 6.2.2 confirm Hypothesis 1, that dividend increases part of a four-quarter structure have a lower return than other dividends at the announcement date.

**Table 6.2.2**
Dividend structures and announcement returns – multivariate results.

This table displays the results of OLS-regressions of cumulative abnormal returns upon dividend increase announcements during the [−1.1]-event window (CAR[−1.1], percentage value) on various dividend- and firm-specific characteristics. All model specifications contain controls for industries (Fama and French 12-Industry Classification), announcement years, and announcement quarters. Models (6) to (8) control for firm fixed-effects instead of industry fixed-effects. Standard errors (in parentheses) are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| 4-Qtr Structure | -0.0051*** | | -0.0039*** | -0.0034*** | -0.0035*** | -0.0034*** | | |
| | (0.001) | | (0.001) | (0.001) | (0.001) | (0.001) | | |
| # 4-Qtr structure | | -0.0063*** | -0.0028*** | | | | | |
| | | (0.001) | (0.001) | | | | | |
| Interim increase | | | | | | | 0.0055*** | 0.0055*** |
| | | | | | | | (0.002) | (0.002) |
| D. rel. div. | -0.0002 | -0.0001 | -0.0002 | -0.0000 | 0.0001 | -0.0003 | -0.0003 | 0.0012 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.001) |
| Div. yield | 0.0814** | 0.0827** | 0.0820** | 0.0592* | 0.0708 | 0.1202*** | 0.1173*** | 0.0865* |
| | (0.034) | (0.035) | (0.034) | (0.032) | (0.044) | (0.031) | (0.031) | (0.046) |
| Contemp. EA | | | | 0.0009 | 0.0015 | 0.0049 | 0.0048 | -0.0132 |
| | | | | (0.006) | (0.005) | (0.010) | (0.011) | (0.010) |
| D. ROA | | | | 0.0554** | 0.0355 | 0.0063 | 0.0163 | 0.0085 |
| | | | | (0.027) | (0.028) | (0.034) | (0.034) | (0.070) |
| MTB | | | | -0.0000 | -0.0005 | 0.0012 | 0.0013 | 0.0010 |
| | | | | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) |
| Size | | | | -0.0018*** | -0.0011*** | -0.0019* | -0.0023** | -0.0015 |
| | | | | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) |
| LVG | | | | -0.0005 | -0.0024 | 0.0030 | 0.0035 | 0.0047 |
| | | | | (0.003) | (0.003) | (0.004) | (0.004) | (0.006) |
| ROA | | | | 0.0456* | 0.0481* | 0.0888*** | 0.0845*** | 0.0840 |
| | | | | (0.025) | (0.029) | (0.032) | (0.032) | (0.058) |
| ILLIQ | | | | | 0.3463*** | 0.1787 | 0.1835 | -0.0116 |
| | | | | | (0.095) | (0.117) | (0.116) | (0.189) |
| Constant | 0.0098*** | 0.0088*** | 0.0099*** | 0.0199*** | 0.0154*** | 0.0148*** | 0.0155*** | 0.0094*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| N | 20,027 | 20,027 | 20,027 | 15,153 | 12,748 | 12,452 | 12,452 | 6,580 |
| R-squared | 0.021 | 0.019 | 0.021 | 0.034 | 0.042 | 0.172 | 0.171 | 0.177 |
| Time Series | 1962-2016 | 1962-2016 | 1962-2016 | 1973-2016 | 1974-2016 | 1974-2016 | 1974-2016 | 1974-2016 |
| Industry fixed effects | Y | Y | Y | Y | Y | N | N | N |
| Firm fixed effects | N | N | N | N | N | Y | Y | Y |
| Sample | All | All | All | All | All | All | All | 4QRS & Interim |
| R-squared | 0.021 | 0.019 | 0.021 | 0.034 | 0.042 | 0.172 | 0.171 | 0.177 |

### 6.2.2. Event Study Analysis with the Restricted Definition of a Four-quarter Structure

Having confirmed the results from (Andres & Hofbaur, 2017), we now challenge their findings by changing the definition of the four-quarter structure. We argue that following a four-quarter structure can be more of a coincidence than a dividend policy if it only happens once. In this section, we therefore define the four-quarter structure according to the restricted definition, as explained in section 5.1., instead of the unrestricted definition. We redo Table 6.2.1 and Table 6.2.2 with the restricted definition of the four-quarter structure to compare the results from the different definitions. Table 6.2.3 is thus equivalent to Table 6.2.1 except for the change in four-quarter definition. As in Table 6.2.1, we hypothesize that the CAR is significantly higher for the group where dividend increase is unpredictable.

**Table 6.2.3**

Dividend Structure and Announcement Returns – Univariate Results for the Restricted Definition of Four-quarter Structure. This table displays cumulative abnormal returns upon dividend increase announcements during the event window from one day before the dividend announcement to one day after the dividend announcement. Delta denotes the difference in mean between the two "4-Qtr Structure" groups; t-stat and p-value correspond to a t-test for equality-of-means and of the two "4-Qtr Structure" groups.

| Window | 4-Qtr Structure = 0 | 4-Qtr Structure = 1 | Delta | t-stat | p-Value |
|---|---|---|---|---|---|
| CAR [-1;1] | 1.26% | 0.62% | 0.64% | 11.06 | 0.00% |
| N | 21,018 | 7,706 | | | |

Table 6.2.3 supports Hypothesis 1 as well. The t-stat shows that there is a significant difference between the announcement returns of the two groups. We see that the average CAR for increases that do not follow the four-quarter sequence is 1.26%, a little lower than the 1.34% in Table 6.2.1. In addition, we see that the number of observations for increases that do not follow the four-quarter structure has increased from 16,713 to 21,018. The average CAR for dividend increases that follow the restricted four-quarter structure is 0.62%, a decrease of 0.12 percentage points from Table 6.2.1.

Table 6.2.4 provides more explanation for the declining CAR of both groups. The table shows the average CAR for different groups of dividend increases depending on how long they have consecutively followed the four-quarter structure under the unrestricted definition. The first group is those dividends that follow the structure only once, which consequently cease to be four-quarter increases in the restricted definition. This amounts to 4.305 dividend increases, and the average CAR of these is 0.94%. In the restricted definition of the four-quarter

structure, the 4.305 dividend increases become part of the group that does not follow the four-quarter structure. Consequently, this lowers the average announcement return for both groups when we go from the unrestricted to the restricted definition of a four-quarter structure.

**Table 6.2.4**
Average CAR for Different Levels of Consecutive Four-quarter Increases.

| # 4-Qtr structure | N | CAR |
|---|---|---|
| 0 | 16,713 | 1.34% |
| 1 | 4,305 | 0.94% |
| 2 | 2,202 | 0.79% |
| 3 | 1,373 | 0.54% |
| 4 | 903 | 0.72% |
| 5 | 631 | 0.58% |
| 6 | 471 | 0.45% |
| 7 | 361 | 0.90% |
| 8 | 284 | 0.54% |
| 9 | 227 | 0.35% |
| Rest | 1,254 | 0.42% |

In Table 6.2.5, we use the same setting as in Table 6.2.2, except for the four-quarter definition. We therefore test whether the results in Table 6.2.3 hold when we include control variables. Our results in specification (1) and (2) are in line with those of Table 6.2.2. However, when we include the 4-Qtr. structure along with the # 4-Qtr. structure variable in specification (3), the latter is still negative but loses significance. In Table 6.2.2, the corresponding coefficient was negative and significant at the one percent level. In model specifications (3) to (6), the coefficient on the 4-Qtr. structure variable remains statistically significant at the one percent level. In specifications (7) and (8), we see a significantly positive coefficient on the Interim increase variable. For the 4-Qtr. structure and Interim increase coefficients, the signs and significance levels are in line with Table 6.2.2. Our results are thus robust to the use of this alternative definition of the four-quarter structure. The pattern for the control variables in Table 6.2.5 develops very similarly to that in Table 6.2.2.

## Table 6.2.5

Dividend Structures and Announcement Returns – Multivariate Results for the Restricted Definition of the Four-quarter Structure.

This table displays the results of OLS-regressions of cumulative abnormal returns upon dividend increase announcements during the [−1.1]-event window (CAR[−1.1], percentage value) on various dividend- and firm-specific characteristics. All model specifications contain controls for industries (Fama & French 12-industry classification), announcement years, and announcement quarters. Models (6) to (8) control for firm fixed-effects instead of industry fixed-effects. Standard errors (in parentheses) are clustered at the firm level. Asterisks denote statistical significance at the 0.01(***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| 4-Qtr Structure | -0.0053*** | | -0.0051*** | -0.0030*** | -0.0036*** | -0.0040*** | | |
| | (0.001) | | (0.001) | (0.001) | (0.001) | (0.001) | | |
| # 4-Qtr structure | | -0.0055*** | -0.0005 | | | | | |
| | | (0.001) | (0.001) | | | | | |
| Interim increase | | | | | | | 0.0055*** | 0.0065*** |
| | | | | | | | (0.002) | (0.002) |
| D. rel. div. | -0.0001 | -0.0001 | -0.0001 | -0.0000 | 0.0001 | -0.0003 | -0.0003 | 0.0011 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.001) |
| Div. yield | 0.0824** | 0.0826** | 0.0825** | 0.0596* | 0.0713 | 0.1213*** | 0.1173*** | 0.0747 |
| | (0.035) | (0.035) | (0.035) | (0.032) | (0.044) | (0.031) | (0.031) | (0.056) |
| Contemp. EA | | | | 0.0009 | 0.0016 | 0.0050 | 0.0048 | -0.0079 |
| | | | | (0.005) | (0.005) | (0.010) | (0.011) | (0.008) |
| D. ROA | | | | 0.0596** | 0.0381 | 0.0088 | 0.0163 | 0.0144 |
| | | | | (0.028) | (0.028) | (0.034) | (0.034) | (0.088) |
| MTB | | | | -0.0000 | -0.0005 | 0.0012 | 0.0013 | 0.0010 |
| | | | | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) |
| Size | | | | -0.0018*** | -0.0011*** | -0.0018* | -0.0023** | -0.0022 |
| | | | | (0.000) | (0.000) | (0.001) | (0.001) | (0.002) |
| LVG | | | | -0.0004 | -0.0023 | 0.0033 | 0.0035 | 0.0030 |
| | | | | (0.003) | (0.003) | (0.004) | (0.004) | (0.007) |
| ROA | | | | 0.0443* | 0.0469 | 0.0869*** | 0.0845*** | 0.0642 |
| | | | | (0.025) | (0.029) | (0.032) | (0.032) | (0.070) |
| ILLIQ | | | | | 0.3497*** | 0.1815 | 0.1835 | 0.0528 |
| | | | | | (0.095) | (0.117) | (0.116) | (0.307) |
| Constant | 0.0092*** | 0.0084*** | 0.0092*** | 0.0194*** | 0.0147*** | 0.0136*** | 0.0155*** | 0.0152*** |
| | 0 | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| N | 20,027 | 20,027 | 20,027 | 15,153 | 12,748 | 12,452 | 12,452 | 4,637 |
| Time Series | 1962-2016 | 1962-2016 | 1962-2016 | 1973-2016 | 1974-2016 | 1974-2016 | 1974-2016 | 1974-2016 |
| Industry fxed effects | Y | Y | Y | Y | Y | N | N | N |
| Firm fixed effects | N | N | N | N | N | Y | Y | Y |
| Sample | All | All | All | All | All | All | All | 4QRS & Interim only |
| R-squared | 0.021 | 0.019 | 0.021 | 0.024 | 0.038 | 0.189 | 0.188 | 0.197 |

### 6.2.3. Discussion of Hypothesis 1

We have now confirmed Hypothesis 1 using both definitions of the four-quarter structure. Our results mirror previous findings on this hypothesis (Andres & Hofbaur, 2017). We support the interpretation by these authors that stock markets to some extent anticipate dividend increase announcements when they follow the four-quarter structure. In the following, we discuss the implications of the results and critically assess methodological limitations. Since the test of Hypothesis 1 is not our main contribution to the literature, we delimit our discussion to the findings that concern the impact of the four-quarter structure on dividend announcements. Consequently, we do not touch upon the impact of the control variables, nor do we discuss the validity of the Dividend Signaling Hypothesis. These fall outside the scope of the paper, and we focus on the role of the four-quarter structure.

With reference to the derivation of Hypothesis 1, the interpretation of the result would be that the markets incorporate the expectation that the dividend will increase according to the four-quarter structure. Hence, when dividend increases are expected, it does not provide as much new information as unexpected dividends. In comparison, dividend increases that happen outside a predictable pattern are unexpected, and should therefore convey more information.

Andres and Hofbaur (2017) suggest that this finding helps to shed light on the declining informational content of dividends. Amihud and Li (2006) find that the increasing prevalence of institutional owners partially reduces information asymmetry. The increasing use of the four-quarter structures seems to further reduce information asymmetry, since the four-quarter structure leads to lower informational content in dividend increases. Consequently, it is plausible that the increasing prevalence of this structure among firms contributes to explain the general decline in the informational content of dividends. The impact of the structure on the declining informational content in dividends further relates to the disappearing dividend phenomena, documented by Fama and French (2001). We thus concur with previous literature (Andres & Hofbaur, 2017; Amihud & Li, 2006) in arguing that as the informational content declines, dividends lose their value as signaling devices. Thus, as dividend entail costs, the declining informational content might explain why there is declining tendency to use dividends. In addition, this finding supports the idea of efficient markets.

While our results confirm Hypothesis 1, there are some methodological limitations to consider. Firstly, we use an event study approach, and this entails the risk of cross-sectional

dependence in our data.[48] In our setting, this applies if the dividend announcements are not independent of each other. A possible solution to this would be to form portfolios of firms based on their announcement dates and do the analysis by event time. Secondly, we could further address endogeneity concerns by doing the analysis separately for firms in the sample that are similar. Andres and Hofbaur (2017) undertake a propensity score match (PSM) analysis and match firms based on characteristics. Based on this, they conduct an analysis similar to our Table 6.2.2 by firms that are matched according to the PSM. Thirdly, while we have used a three-day event window, we could conduct further robustness tests by extending the window length. Finally, our analysis suffers from the evident omitted variable bias of not including special dividend announcements and institutional ownership, which is due to lack of data access. These aspects represent limitations to our inferences, and our conclusions are thus made with reservations in acknowledgement of this. Nonetheless, as the confirmation of Hypothesis 1 is not our major contribution to the field of research, we deem it outside of our scope to pursue further robustness of this result.

In summary, we have tested Hypothesis 1, that the use of the four-quarter structure reduces the information content of dividends. Firstly, in the descriptive analysis we verified the prevalence of the four-quarter structure in dividends, by showing how firms seem to peg their dividend increase decision to that made four quarters ago. Furthermore, the use of the four-quarter is increasing over time, a development that cannot be ascribed to sample attrition. Secondly, in the event study analyses we verified that the dividend-increasing announcements that follow the four-quarter structure have significantly lower informational content of dividends. Thirdly, while we acknowledge limitations in our research approach, we contend that our analysis shows considerable support for the findings of Andres and Hofbaur (2017). The verification of these results serves the purpose of establishing the motivation for our subsequent analyses. Specifically, as the results show an important implication of this structure on Dividend Signaling theory. It is necessary to further clarify what leads firms to

[48] A key assumption when returns are aggregated across firms in event studies is that events are independent of each other. Often, this will not be the case, especially when events are clustered through time. If events are not independent, this violates the assumption that the covariances between the returns are zero, which is used in the derivation of the aggregate variance term (Brooks, 2014).

follow the four-quarter structure. In the following, we test Hypotheses 2.i to 2vii and Hypothesis 3.

## 6.3. Analysis of Hypotheses 2.i to 2.vii

The last section confirmed that the positive abnormal return of dividend increase announcements are lower for dividend increases that follow a four-quarter structure. In this section, we analyze what leads firm to follow the four-quarter structure. Andres and Hofbaur (2017) find the inspiration for this analysis in the finding that following a four-quarter structure leads to relatively higher firm value. In untabulated results, we confirm this, using Fama and French's (1998) valuation model augmented by a control for the four-quarter structure. An interpretation of this could be that investors value higher predictability in dividends. Due to endogeneity concerns, it is hard to establish that being a four-quarter firm leads to higher value. It might as well be the reverse that firms with higher value tend to follow the structure. Having found that firms with high market value tend to follow the four-quarter structure, Andres and Hofbaur (2017) analyze what other firm characteristics drive the probability of adoption. In this section, we attempt to verify their findings, according to Hypotheses 2.i to 2.vii. In Table 6.3.1, we apply various specifications of Equation 5.3.1, in terms of the explanatory variables we include. We develop the model specifications in line with Andres and Hofbaur (2017), to make the results directly comparable to their findings. In the following paragraphs, we explain how we build up the model. Appendix Table 6.3.1 presents correlations for all variables included in this analysis.

In specification (1), we include the dividend-related characteristics relative dividend increase and the dividend yield. As stated in Hypotheses 2.i and 2.ii, we expect both to affect the probability of adoption negatively. In specification (2), we include MTB and Size, which we expect will positively affect the probability of adopting the four-quarter structure according to Hypotheses 2.iii and 2.iv. In addition, we include leverage and ROA. As for leverage, our intuition is that this will negatively impact the probability of following a fixed structure of dividend increases. Higher leverage increases financial expenses, and since more of earnings must go to service interest payments, there is less room for continual dividend increases. We include ROA, as we believe firms will consider their profitability in the decision to adopt the four-quarter structure.

In specification (3), we include D.ROA, which measures the change in earnings over the previous year. The change in earnings partly establishes the financial scope for changing dividends, and firms would likely consider this in the decision to adopt the structure. In specification (4) we include Earnings variation, which we expect to negatively affect the probability of adoption according to Hypothesis 2.v. In specification (5), we include Illiquidity, but at the same time we exclude Size. Illiquidity exhibits a high negative correlation with Size. In Table 4.3.3, we see a correlation of -0.542, and the intuition behind this is that larger firms are traded more frequently. We therefore firstly show the effect of Illiquidity in a model where Size is excluded. Specification (6) is equivalent to (5), except that Size is reincluded into the model. In specification (7), we include Repurchases, indicating how many shares, if any, that the firm has repurchased during the quarter t. Finally, in specification (8) we include the number of consecutive prior four-quarter increases (#4-Qtr. structure), and this specification shows the results of Hypotheses 2.i to 2.vii when all variables are included. However, without further alterations, our model runs the risk of having an omitted variable bias, which we address by controlling for time- and industry fixed-effects.

The relative increase in dividends is negative and significant at the one percent level in all specifications, and we thereby confirm Hypothesis 2.i. We likewise confirm Hypothesis 2.ii, as the dividend yield is negative and significant at the one percent level in all specifications. The coefficient on MTB is positive and statistically significant in all specifications, albeit only at the ten percent level when all variables are included. We therefore confirm Hypothesis 2.iii. Size is positive and significant at the one percent level throughout the model. This result confirms Hypothesis 2.iv, as the size of the firm increases the probability of adopting the four-quarter structure. Hypothesis 2.v posits that the likelihood of adoption increases as earnings stabilize, but this is not what we find in Table 6.3.1, the coefficient on Earnings variation is negative and significant in specifications (4) to (7). However, when we include the persistence variable in specification (8) it becomes insignificant, and we consequently reject Hypothesis 2.v.

The coefficient on Repurchases is slightly positive but statistically insignificant, which shows that stock repurchasing firms are not more likely to adopt a four-quarter structure than firms that do not repurchase stock. We consequently reject Hypothesis 2.vi. Our final hypothesis states that the past propensity to follow the structure positively affects the probability of following the structure again, and this is what we see in specification (8). The variable #4-Qtr.

structure is positive and significant at the one percent level, and we thus confirm Hypothesis 2.vii. This concludes on the results of Hypotheses 2.i to 2.vii, and we next turn to report the effect of the control variables.

Leverage is insignificant when all variables are included, but consistently negative as expected. ROA is insignificant in all specifications, while D.ROA is negative and significant at the one percent level in all specifications. The negative coefficient D.ROA indicates that increases in earnings negatively influence the likelihood of adopting a four-quarter structure. Illiquidity is negative and significant in specification (5), showing that frequently traded firms are more likely to follow a four-quarter structure. When reincluding Size in (6), Illiquidity becomes insignificant, but it returns to being significant at the ten percent level in specification (8).

Our results have shown what firm characteristics affect the probability of four-quarter adoption. To quantify the effect of these variables, we calculate and compare their marginal effects. In a logit model, we measure the marginal effect at the means, which is the instantaneous rate of change.[49] Hence, when comparing the effect of the variables, we do so with the reservation that it only reflects the impact of the given variable when holding all others constant at their means. To facilitate the comparison of these variables, we multiply the marginal effect by the standard deviation of the variable. As it is hard to determine a unit change in these different variables, let alone an infinitesimal rate of change, our best way of comparing the variables is to see the effect of an increase of one standard deviation.[50]

In general, the marginal effect in percentage terms ranges between the interval of -4% to 4%, only exception being the persistence variable. For the relative dividend change and the dividend yield, the marginal effects of an increase of one standard deviation are -2.48% and -3.35%, respectively. For the MTB and Size, the corresponding changes of one standard

[49] This means that we measure the marginal effect of an infinitesimal change for a variable, holding all other variables constant at their means. The marginal value is not the same across all levels, as a logit regression is a non-linear function.

[50] We measure the marginal effects of the variables in specification (8), where all variables are included.

deviation increase probability of adoption by 2.03% and 4.45%, respectively. The effect of a one standard deviation increase in ROA and ILLIQ decrease the probability of adoption by -1.87%, and -1.33%, respectively. The largest impact, however, is from the past number of consecutive adoptions, the #4-Qtr. structure variable. A change of one standard deviation increases the probability of adoption by 24.47%.

We have analyzed what leads firms to adopt a four-quarter structure in dividend increases. Our results show that firms who adopt the four-quarter structure are typically large, highly valued, make only modest dividend increases, have relatively lower dividend yields, are liquid and have declining earnings. In addition, the past tendency to adopt the structure highly influences the likelihood of adoption. The results corroborate previous findings in the field (Andres & Hofbaur, 2017). However, we do not see an effect of the variables Earnings variation or Repurchases on the probability of adopting the structure. Furthermore, it is new that the change in earnings and illiquidity are significant. In addition to verifying the findings from extant literature, we have contributed by adding more economic interpretations of the variables, in the form of the marginal effects. In the following, we discuss the implications of these findings for Hypotheses 2.i to 2.vii. There are certain limitations to the measure of firm adoption in our dependent variable. As these also apply to Hypotheses 3, we discuss these limitations in section 6.4.

## Table 6.3.1

Four-Quarter Structure and Firm Characteristics – Multivariate Results

The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. The dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. All specifications include controls for industries, in the form of Fama and French 49-industry classification. We further control for announcement year and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| D. rel. div. | -1.0987*** | -1.0359*** | -0.9777*** | -0.9678*** | -1.0289*** | -0.9757*** | -0.9764*** | -0.4868*** |
| | (0.122) | (0.129) | (0.129) | (0.135) | (0.135) | (0.135) | (0.135) | (0.121) |
| Div. Yield | -9.6201*** | -6.6404*** | -7.6951*** | -6.2253** | -4.9415** | -5.8757** | -5.8971** | -7.7796*** |
| | (1.891) | (2.317) | (2.337) | (2.429) | (2.481) | (2.488) | (2.492) | (2.051) |
| MTB | | 0.1284** | 0.1315** | 0.1729*** | 0.2774*** | 0.1678*** | 0.1690*** | 0.0973* |
| | | (0.056) | (0.055) | (0.059) | (0.057) | (0.060) | (0.060) | (0.050) |
| Size | | 0.1957*** | 0.1910*** | 0.1722*** | | 0.1587*** | 0.1550*** | 0.0864*** |
| | | (0.025) | (0.025) | (0.026) | | (0.029) | (0.030) | (0.023) |
| LVG | | -0.3447 | -0.3260 | -0.3494 | -0.2579 | -0.3811 | -0.3807 | -0.3653 |
| | | (0.255) | (0.255) | (0.268) | (0.273) | (0.273) | (0.273) | (0.226) |
| ROA | | -3.4208 | 0.0361 | -0.0266 | -1.3289 | -0.2757 | -0.3259 | 0.4485 |
| | | (2.529) | (2.693) | (2.908) | (2.973) | (2.967) | (2.970) | (2.489) |
| D.ROA | | | -14.3229*** | -13.6013*** | -14.1331*** | -14.0617*** | -14.0469*** | -8.2803*** |
| | | | (2.556) | (2.630) | (2.692) | (2.697) | (2.696) | (2.663) |
| Earnings variation | | | | -9.7434** | -13.3806*** | -9.6106** | -9.5985** | -1.5345 |
| | | | | (4.196) | (4.149) | (4.226) | (4.234) | (3.647) |
| ILLIQ | | | | | -21.0881*** | -6.5722 | -6.9205 | -6.6798* |
| | | | | | (3.962) | (4.183) | (4.217) | (3.665) |
| Repurchases | | | | | | | 0.0001 | 0.0001 |
| | | | | | | | (0.000) | (0.000) |
| # 4-Qtr. structure | | | | | | | | 2.6643*** |
| | | | | | | | | (0.098) |
| Constant | -2.3856** | -1.0685 | -1.2392 | -1.1682 | -0.4176 | -1.5012 | -1.4811 | -1.4611 |
| | (1.015) | (0.825) | (0.891) | (1.083) | (1.092) | (1.065) | (1.065) | (0.962) |
| N | 17,619 | 13,215 | 13,152 | 12,481 | 12,115 | 12,115 | 12,115 | 12,115 |
| R^2-pseudo | 0.0872 | 0.113 | 0.114 | 0.117 | 0.113 | 0.117 | 0.117 | 0.189 |
| Time Series | 1962-2015 | 1971-2015 | 1971-2015 | 1972-2015 | 1972-2015 | 1972-2015 | 1972-2015 | 1972-2015 |

### 6.3.1 Discussion of Hypotheses 2.i to 2.vii

Concerning Hypothesis 2.i, our results confirm that firms who adopt the four-quarter structure increase dividends by only small amounts. Likewise, we confirm Hypothesis 2.ii, that firms who follow the structure have lower dividend yields. Both these findings are consistent with the consensus in dividend literature that dividend increases are costly to the firm (Amihud & Li, 2006). As for the relative dividend change, firms prefer to only increase dividends by small amounts, given that the structure implies continual increases in future years. There are opportunity costs of increasing dividends, so even though the firm values the ability to follow the structure, it acknowledges the costs from this decision. Likewise, firms who already pay high dividends relative to their share price are relatively more reluctant to adopt the structure, as they would find it difficult to increase the level even further. Hence, the lower the current dividend yield, the less concern for taking on the commitment of continual increases in dividends in future years. Taken together, the results for Hypotheses 2.i and 2.ii seem plausible in relation the argument that dividends are costly to the firm.

The positive and significant coefficient for MTB confirms Hypothesis 2.iii. An interpretation along the lines of the derivation of the hypothesis entails that a high MTB gives the firm the ability to commit to higher dividend levels. A comment to our confirmation of Hypothesis 2.iii, though, is that it is only significant at the ten percent level. However, a reason for the lack of significance of the variable could be its high correlation with size and illiquidity, which are both significant as well. In addition, looking at the marginal effect of the MTB, its absolute percentage impact is comparable to those of the more significant relative dividend change and the change in earnings.

As for Hypothesis 2.iv, the results confirm that larger firms are more likely to follow the four-quarter structure. Following from our derivation of 2.iv, this supports the intuition that since the four-quarter structure requires more dividend increase, and since this entails transaction costs, it is more likely that larger firms follow it. In addition, Size is highly negatively correlated with our illiquidity measure, and it would be possible that Size to some extent proxies for the liquidity of the firm's stock. In specification (5), we see that illiquidity is negatively significant at the one percent level, while as Size reenters, illiquidity becomes insignificant. Size thus seems to somewhat proxy for illiquidity, and the significant positive coefficient for Size would then imply that firms that have a higher liquidity are more likely to

adopt the structure. In relation to this, we find that illiquidity is significant in the final specification. Hence, it seems in our case that the liquidity of the firm's stock affects the probability of adoption beyond what is captured by the size of the firm.

The results for Hypothesis 2.v show, contrary to expectations, that Earnings variation does not affect the probability of adoption. The variable becomes insignificant after the inclusion of #4-Qtr. structure, and this suggest that the past tendency to follow the structure is more decisive for the firm's decision than variation in earnings. The change in earnings, on the other hand, negatively influences the probability of adoption. This is unexpected, seen in relation to previous findings on earnings changes. If anything, we would expect that it would positively affect dividends as Linter (1956) suggests, or for it to have no effect as proposed by Skinner (2008). In addition, the hypothesis that earnings stability would affect the probability of adoption was incompatible with an expectation for a direction in earnings changes to affect the probability. Nonetheless, the result suggests that there is a significant inverse relationship between earnings increases and the probability to follow the four-quarter structure. Essentially, this implies that the lower earnings compared to last year, the more likely the firm is to commit to continual dividend increases. There is no clear suggestion as to why we should see this effect. One interpretation could be that the negative earnings coefficient reflects that the firm has reached a maturity stage and starts to distribute cash. Profitability tends to mean revert over time (Nissim & Penman, Ratio Analysis and Equity Valuation: From Research to Practice, 2001), consistent with the negative earnings increase coefficient. When earnings have stabilized, and growth is hard to achieve, the firm might increasingly distribute cash to shareholders. Hence, the coefficient could indicate that it is firms who have reached a maturity stage that are more likely to follow the structure.

The result of table 6.3.1 rejected Hypothesis 2.vi, that the likelihood of adopting the four-quarter structure increases if the firm repurchases shares. As a first comment, the same variable showed significance only at the ten percent level in previous research, so our finding is not a major divergence from those results. In addition, the proposition that being a share repurchasing firm should encourage the adoption of a four-quarter structures is subject to debate. Considering that firms increasingly favor repurchases over dividends as a payout distribution channel (Fama & French, 2001; Skinner, 2008), we would perhaps instead se an inverse relationship for many observations between repurchasing more shares and paying

higher dividends. This might be a reason why the Repurchases variable does not increase the likelihood of adoption.

As to our final hypothesis, we confirmed that the persistence by which a firm follows the structure increases the likelihood of adoption. Indeed, it seems plausible that the past number of consecutive increase affects whether a firm will decide on following the structure at time t. The more the firm has done so, the more it resembles an active choice. The importance of the #4-Qtr. structure variable for the probability of adoption is also reflected in the substantial increase in R-squared when including the variable in the model. The measure of fit increases considerably when this variable is included, suggesting that the model would suffer from an omitted variable bias if it were not included.

However, the use of the variable measuring past adoptions on the probability of current adoptions raises methodology concerns. Specifically, the risk of including this variable into the model is that our results do not have discriminant validity. In general, this happens when an independent variable and a dependent variable by construction measure the same thing (Campbell & Fiske, 1959). In our setting, one could question whether the #4-Qtr. structure variable and the dependent variable both measure the same tendency; that the firm is following the four-quarter structure. The #4-Qtr. structure variable accumulates the most recent consecutive four-quarter adoptions, and as this variable increases, it indicates the firm is following the structure. At the same time, the dependent variable proxies for the firm's decision on whether it will follow the structure. When we also include the #4-Qtr. structure variable, it can conceptually be hard to discriminate between them, hence the concern for the lack of discriminant validity. Arguably, when using a variable that measures the amount of consecutive times that a firm has already followed the structure, to predict whether the firm will follow the structure a time t, this is a case for such concern. Andres and Hofbaur (2017) do not address this, but we attempt to investigate the concern in what follows.

We address this possibility in two ways. Firstly, we consider the correlation between the #4-Qtr. structure variable and the dependent variable. A high correlation is usually an indication of a problem, when there is a concern that an independent and a dependent variable measure the same thing. Usually, it is desirable that they are highly correlated, but here it would enforce the impression that the variables capture the same tendency. The correlation between the variables is 0.39, which is high but not necessarily an indication of a lack of discriminant

validity. In untabulated result, we use model specification (8) with alternative measures of past adoptions. We find that the results hold if we use the Post-4QRS variable or the Total past adoptions variable. These two variables do not to the same extent as the # 4-Qtr. structure variable reflect the same information as the dependent variable. The Post-4QRS simply indicates whether the firm has previously made an adoption, and it does not reflect how many times a firm has followed the structure. The Total Adoption variable aggregates all adoptions prior to time t, but does not require that adoptions be consecutive for them to accumulate.[51] Based on this, we see that the results are insensitive to the use of alternative variables measuring past adoptions. Using the #4Qtr. structure variable therefore does not seem to pose a threat to discriminant validity for our findings.

In conclusion, our results for Hypotheses 2.i to 2.vii highly resemble previous findings, but there are differences as well. Due to the lack of data access, we were unable to test for the effect of institutional ownership and special dividend announcements, which prevents us from testing these results. However, as both turn out insignificant in Andres and Hofbaur (2017), we do not expect that to be a major deficiency of our result. It is hard to detect the reasons for the differences in our results, but they are most likely due to differences in data availability and perhaps somewhat to variable construction. Nonetheless, we contend that our results overall verify the findings by Andres and Hofbaur (2017). This sets precedent for the later analysis of peer effects in the decision to follow a four-quarter structure, as we can control for the variables included in this section. This allows us to test, whether there is an effect of peer adoptions beyond the impact of firm characteristics we have determined in this section.

[51] In that way, the Total Adoption variable circumvents a different problem of the #-4Qtr. structure variable, which is the rigid requirement of consecutive adoptions. The #4-Qtr. structure variable disregards all past adoptions if there is a break in the sequence of four-quarter increases. For example, the variable might fail to capture that a firm has previously followed the structure 20 times, simply because there was a break in the most recent year. In that way, the history of this firm in terms of adoptions becomes indistinguishable from that of firm that has never followed the structure. The Total Adoption variable, on the other hand, accounts for all adoptions regardless of temporary breaks.

## 6.4. Analysis of Hypothesis 3

In the preceding section, we tested Hypotheses 2.i to 2.vii concerning the verification of established knowledge on why firms follow the four-quarter structure. In this section, we test whether peer decisions to adopt the structure influence the firm's decision. According to Hypothesis 3, we expect a firm to be more likely to follow the four-quarter structure the more peers decide to follow the four-quarter structure. In section 5.4, we introduced our measures of peer adoption, the Peer Ratio and the Peer Dummy. We therefore commence the analysis of Hypothesis 3 by presenting descriptive statistics on the relation between peer adoptions and firm adoption of the four-quarter structure in section 6.4.1.[52] Subsequently, we conduct a logit analysis of peer effects to test Hypothesis 3 in section 6.4.2.

### 6.4.1. Descriptive Statistics for Hypothesis 3

As outline in the methodological explanation of Hypothesis 3, we use the Peer Ratio as a measure of peers' adoption of the structure in our baseline model. We further apply the Peer Dummy in this descriptive section as well as in robustness tests. We have already presented descriptive statistics for variables related to the probability of four-quarter adoption, at this stage it is therefore suffices to make an overview of the variables related to peers' adoption as well. The Peer Ratio has a mean of 0.38, and a standard deviation of 0.33. For the Peer Dummy, the mean is 0.45 and the standard deviation is 0.50. The correlation matrix in Appendix Table 6.4.1 shows the correlation between the Peer Ratio and the Peer Dummy in relation to all other variables that we use to analyze the probability of four-quarter adoption. From there we see that the correlation between the Peer Ratio and the dependent variable, Adoption, is 0.10, while it is 0.07 between the Peer Dummy and Adoption. In comparison, the correlation between MTB and Adoption is 0.22, and it is 0.16 between Size and Adoption. The correlation between the Peer Ratio and Adoption is similar in magnitude to correlations between earnings changes and illiquidity. The correlation between the two Peer Ratio and the Peer Dummy is naturally very high, and Appendix Table 6.4.1 shows that this correlation is

[52] As outlined in the data section, we use data after 1971 due to lack of data availability in COMPUSTAT for the most part of our logit analyses. Therefore, these descriptive statistics in this section are based on data for this period as well. In untabulated results, we find that the descriptive data is qualitatively similar if we include the entire data sample period.

0.80. Apart from this, the Peer Ratio and the Peer Ratio both exhibit most correlation with the MTB and the #4-Qtr-structure variable.

To further support our theoretical intuition behind peer effects, we now present descriptive statistics for the relation between peer adoption and firm adoption of the four-quarter structure. We use the Peer Dummy as a measure of peer adoption in this part, as it allows us to make a simple distinction between whether peers have recently adopted the structure. In Table 6.4.1, we look at all increases in dividends, to see how the share of four-quarter adoptions changes when peers adopt the structure. The first column indicates whether peers have recently adopted the structure, where "No" means that Peer Dummy equals zero and "Yes" that the Peer Dummy equals one. Column two shows whether the firm decides to follow the structure. This is measured via the Adoption variable, where "No" indicates that the variable equals zero, and "Yes" that it equals one. Column three shows the number of dividend increases for the respective scenarios, and column four shows the percentage shares. In the top half of the table where no peers have adopted, we see in the rightmost column that a minority of dividend increases follow the four-quarter structure. In the lower half of the table, where peers have recently adopted, we see that the majority of dividend increases are four-quarter adoptions. This gives an indication of a peer effect, as the ratio of four-quarter adoptions changes from 45.89% to 53.48% when peers have recently adopted the four-quarter structure. In a t-test of the difference in means, we find that the difference in the ratios is statistically significant.

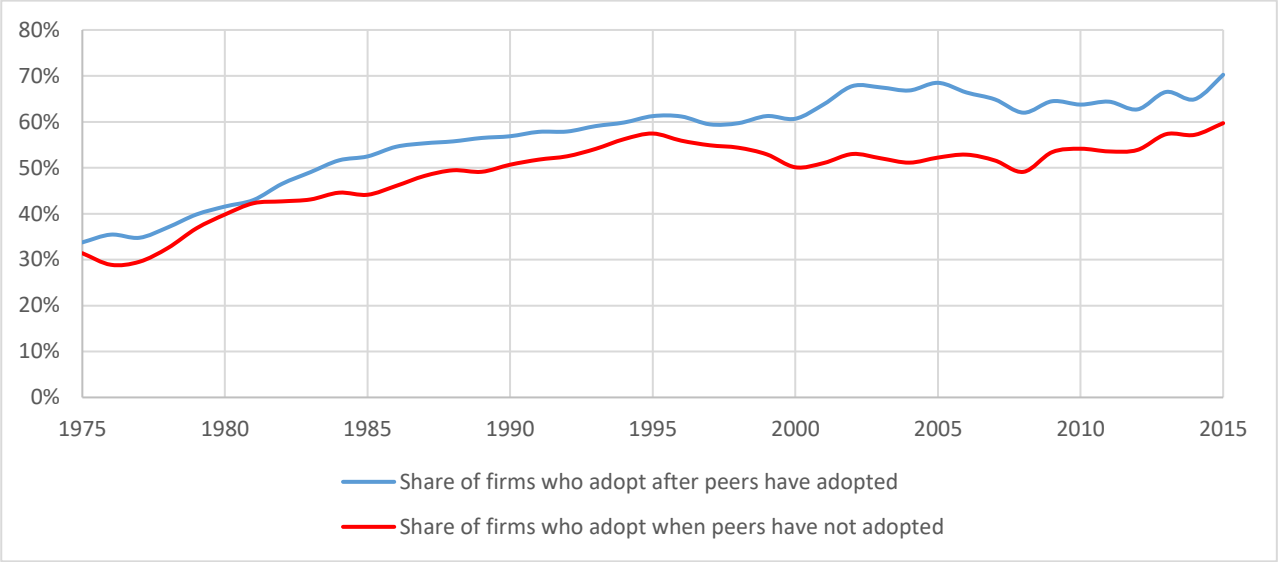
**Table 6.4.1**

Firm Adoption of the Four-quarter Structure Conditional on Peer Adoption
The table shows the share of dividend increases that result in adoption of the four-quarter structure (Percentage), dependent on whether peers have recently adopted. The leftmost column (Peer Adoption?) indicates whether peers have recently adopted the structure, and the next columns (Firm Adoption and Number of Dividend Increases) show how many dividend increases results in four-quarter adoption.

| Peer Adoption? | Firm Adoption | Number of Dividend Increases | Percentage |
|---|---|---|---|
| No | No | 6,721 | 54.11% |
| | Yes | 5,700 | 45.89% |
| **Total** | | **12,421** | **100.00%** |
| Yes | No | 4,694 | 46.52% |
| | Yes | 5,397 | 53.48% |
| **Total** | | **10,091** | **100.00%** |

The previous table shows an aggregated picture of firm adoptions by aggregating information over approximately fifty years. In Figure 6.4.1, we plot how the ratio of four-quarter adoptions that follow peer adoptions develops over time. As we know adoption of the four-quarter structure has been increasingly prevalent in recent years, we further plot the ratio of four-quarter adoptions that are not preceded by a peer adoption. As seen in Figure 6.4.1, both ratios are increasing over time, consistent with our previous results of an increasing tendency of adoption. Furthermore, the ratio of adoptions that follow peer adoptions is consistently higher than the corresponding ratio when peers have not adopted. Consequently, Figure 6.4.1 confirms the difference shown in Table 6.4.1 that the firm is more likely to adopt the four-quarter structure when peers have adopted the structure.

**Figure 6.4.1**
Firm Adoption of the Four-quarter Structure Conditional on Peer Adoption – Development Over Time
The two lines shows the development of the ratio of four-quarter adoptions over total dividend increases. The blue line measures the ratio when peers have recently adopted the structure, while the red line measure the corresponding ratio when peers have not adopted the four-quarter structure.




We have examined the relation between peer adoption of the four-quarter structure and firm adoption of the structure, and we find an indication of a positive relationship. This supports our theoretical intuition that firms are likely to look for peer actions in the decision to follow the four-quarter structure. With this indication of a positive relationship, we proceed to analyze whether peer adoptions have a statistically significant impact on the probability of four-quarter adoptions by the firm.

### 6.4.2. Baseline Model Result

To test for peer effects in our baseline model, we apply the logit regression expressed in Equation 5.4.2 with the Peer Ratio as the major explanatory variable. As in Table 6.3.1, the dependent variable is equal to one if the firm adopts the four-quarter structure in t+4Q, implying that the decision is taken at time t to start following the structure. In Table 6.4.2, we first test for peer effects while controlling for dividend characteristics. Specification (1) therefore includes the relative size of the dividend increase as well as the magnitude of the increase. In specification (2), we include controls for firm characteristics, such as size and leverage. In specifications (3) to (6), we gradually add variables that we used in Table 6.3.1 as controls. According to Hypothesis 3, we expect to see a positive Peer Ratio coefficient,

indicating that peer adoption of the four-quarter structure increases the likelihood of firm adoption of the four-quarter structure.

In Table 6.4.2, we see in specifications (1) to (5) that the Peer Ratio is positive and significant at the one percent level. This suggests that firms pay attention to peers' decisions when deciding on adopting the four-quarter structure. When we include the past number of four-quarter adoptions, in specification (6), the Peer Ratio is still significant but at the five percent level. Thus, we see a significant effect even when accounting for the number of times that the firm has already followed the structure. Our baseline model results thus support Hypothesis 3, as the adoption of the four-quarter structure by peers increases the probability of firm adoption.

In terms of the control variables, they mostly develop in the same way as in Table 6.3.1. The relative dividend change is negative and significant at the one percent level through all specifications. The dividend yield is negative and significant at the one percent level in specification (1) and (2). It becomes significant at the five percent level in specifications (3) to (5), but it is again significant at the one percent level in specification (6). In Table 6.4.2, MTB is positive and significant at the one percent level in all specifications. Size and Earnings variations are likewise significant at the one percent level in specifications (1) to (5). However, they exhibit lower levels of significance in specification (6), of five and ten percent, respectively, when we account for previous adoptions by the firm. Size and the persistence variable have a correlation of around 0.30.[53] A possible explanation for the lower significance on Size is that bigger firms are more likely to persistently follow the four-quarter structure, and that the persistence variable therefore takes some of the significance from Size.

Leverage, ROA and ILLIQ are negative but insignificant in all specifications, while D.ROA is negative and significant at the one percent level in all specifications. The variable Repurchases is positive but insignificant when we include it in specifications (5) and (6). The persistence in following the structure, the #4-Qtr. structure variable, is positive and significant at the one percent level. Having reported the results of the control variables, we now have an overview

[53] See Appendix 6.4.1

of what leads firms to adopt the four-quarter structure. Apart from peer adoptions, the probability of firm adoption of the four-quarter structure is positively affected by MTB, Size and the past number of adoption. On the other hand, the change in dividend, the dividend yield, the change in earnings and earnings variation negatively affect the probability. These results mostly corroborate those of Table 6.3.1 on firm characteristics, although we cannot directly compare them in the absence of industry fixed-effects.[54]

We have determined which factors statistically affect the probability of adoption, but we further calculate the marginal effects to better understand the economic impact of these variables. As in Table 6.3.1, we cannot discuss a general marginal effect for all levels of the Peer Ratio in a logit model. Instead, we compare how the marginal effect at the means changes from specification (1) to (6) when we add more control variables. The marginal effect of the Peer Ratio is 0.087 in specification (1) and drops to 0.038 in specification (6) where all controls are included. Thus, consistent with the decline in the coefficient from specifications (1) to (6), the marginal effect of the Peer Ratio reduces as we include more variables. To better interpret the effect and make it comparable to that of the additional variables, we multiply the marginal effect by the standard deviation of the variable. An increase in the Peer Ratio of one standard deviation gives an increase in the likelihood of adopting the four-quarter structure of 1.3% in specification (6). Compared to some of the other significant variables in specification (6), the marginal effect of in the Peer Ratio in specification (6) is lower than for instance MTB (2.98%) and the relative dividend change (-2.2%), while it is higher in magnitude than that of Earnings variation (-0.98) and earnings changes (-0.86%).

[54] In the robustness tests, we apply various industry fixed effects, among them the Fama and French 49 Industry Classification used in Table 6.3.1.

## Table 6.4.2

Four-quarter Structure and Peer Effects – Baseline Model.
The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. The dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. We further control for announcement year-and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Peer Ratio | 0.3895*** | 0.3480*** | 0.3190*** | 0.3155*** | 0.3150*** | 0.1966** |
| | (0.077) | (0.084) | (0.085) | (0.086) | (0.086) | (0.077) |
| D. rel. div. | -1.1911*** | -1.0807*** | -1.0552*** | -1.0651*** | -1.0654*** | -0.5334*** |
| | (0.126) | (0.137) | (0.140) | (0.141) | (0.141) | (0.126) |
| Div. yield | -10.2988*** | -7.9041*** | -6.2920** | -5.7580** | -5.7869** | -7.6544*** |
| | (1.901) | (2.372) | (2.445) | (2.511) | (2.513) | (2.071) |
| MTB | | 0.2220*** | 0.2722*** | 0.2718*** | 0.2730*** | 0.1763*** |
| | | (0.055) | (0.059) | (0.060) | (0.060) | (0.049) |
| Size | | 0.1554*** | 0.1342*** | 0.1215*** | 0.1172*** | 0.0553** |
| | | (0.025) | (0.026) | (0.029) | (0.030) | (0.022) |
| LVG | | -0.0953 | -0.1208 | -0.1469 | -0.1485 | -0.1655 |
| | | (0.259) | (0.274) | (0.278) | (0.279) | (0.227) |
| ROA | | -1.3900 | -1.1004 | -1.4572 | -1.5175 | -0.3740 |
| | | (2.697) | (2.923) | (2.978) | (2.985) | (2.484) |
| D.ROA | | -16.1597*** | -15.0641*** | -15.5065*** | -15.4819*** | -9.1162*** |
| | | (2.554) | (2.623) | (2.698) | (2.696) | (2.646) |
| Earnings variation | | | -15.1703*** | -15.2528*** | -15.2459*** | -6.1644* |
| | | | (4.213) | (4.245) | (4.248) | (3.636) |
| ILLIQ | | | | -5.4397 | -5.8417 | -5.8603 |
| | | | | (4.159) | (4.175) | (3.617) |
| Repurchases | | | | | 0.0002 | 0.0001 |
| | | | | | (0.000) | (0.000) |
| # 4-Qtr Structure | | | | | | 2.7492*** |
| | | | | | | (0.096) |
| Constant | -0.7640 | 0.2362 | 0.6067 | 0.6056 | 0.6307 | 0.5699 |
| | (0.660) | (0.379) | (0.403) | (0.419) | (0.420) | (0.379) |
| N | 17,619 | 13,180 | 12,509 | 12,142 | 12,142 | 12,142 |
| R^2-pseudo | 0.0737 | 0.0790 | 0.0816 | 0.0809 | 0.0809 | 0.172 |
| Time series | 1973-2015 | 1973-2015 | 1974-2015 | 1974-2015 | 1974-2015 | 1974-2015 |

### 6.4.3. Alternative Explanatory Variable for Peer Adoption

In this section, we replace the major explanatory variable Peer Ratio by the Peer Dummy, as a first robustness test of our baseline results. In Table 6.4.3, we thus employ Equation 5.4.4 and build up the analysis in line with the baseline model in terms of the gradual additions of control variables. The Peer Ratio is a continuous measure, which accounts for all peer adoptions of the structure. The Peer Dummy, on the other hand, neglects adoptions if the average level of adoptions in the peer group does not exceed the market average. Table 6.4.3 supports the baseline model results, as the Peer Dummy is positive and significant at the one percent level in specification (1) to (5). It is furthermore significant at the one percent level in specification (6), unlike the corresponding specification in the baseline model where the significance level is five percent. Our results are thus qualitatively insensitive to our choice of explanatory variable and further support Hypothesis 3.

For the control variables, there are some differences compared to the baseline model, although many develop similarly. The coefficients for the relative dividend change, LVG, D.ROA, Repurchases and # 4-Qtr. structure are in line with the baseline model. In contrast, the dividend yield is negative and significant at the one percent level in all specification excepts in specification (3), where the variable is significant at the five percent level. MTB is positive and significant at the one percent level in specifications (2) and (3). In specifications (4) and (5), MTB becomes significant at the five percent level, before turning insignificant in specification (6) when accounting for the past number of consecutive four-quarter adoptions. MTB is insignificant for the first time in our analysis of four-quarter adoption, but a possible explanation is that firms with a higher MTB are more likely to persistently follow the four-quarter structure. MTB and the # 4-Qtr structure have a correlation of 0.2[55], and it is thus possible that the # 4-Qtr. structure variable takes some of the significance from MTB. ROA is still negative and insignificant in specification (2) and (3). In specification (4) to (6), ROA becomes positive but is still insignificant when adding ILLIQ. In specification (4) and (5), ILLIQ is significant at the five percent level, before becoming significant at the one percent level in specification (6). The correlation between ILLIQ and MTB is -0.19, implying that this

[55] See appendix 6.4.1

could also somewhat explain why MTB becomes insignificant in specification (6). In summary, while Table 6.4.3 supports Hypothesis 3, many of the control variables are sensitive to the choice of explanatory variable for peer adoption.

Using an indicator variable to measure peer adoption allows for a different interpretation of the marginal effect. As the indicator variable can only take the value of zero and one, the marginal effect indicates the effect on the likelihood of adoption when the variable takes the value of one. Based on our definition of the Peer Dummy, this is the effect on the probability of firm adoption if peers have recently adopted the structure. Comparing the marginal effect of the Peer Dummy to that of the other variables[56], we see that the effect is 0.82% for the Peer Dummy. In comparison, significant firm characteristics as MTB and Size have corresponding effects of 2.95% and 2.31%, respectively.

[56] Multiplying by the standard deviation of the variable

## Table 6.4.3

Four-quarter Structure and Peer Effects – Alternative Major Explanatory Variable.
The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. The dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. We further control for announcement year- and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Peer Dummy | 0.2406*** | 0.2045*** | 0.1906*** | 0.2006*** | 0.2002*** | 0.1326*** |
| | (0.044) | (0.051) | (0.051) | (0.046) | (0.046) | (0.042) |
| D. rel. Div | -1.1968*** | -1.0866*** | -1.0587*** | -0.9457*** | -0.9472*** | -0.4323*** |
| | (0.126) | (0.137) | (0.141) | (0.125) | (0.125) | (0.112) |
| Div. Yield | -10.218*** | -7.9043*** | -6.2829** | -7.6082*** | -7.6804*** | -9.1005*** |
| | (1.900) | (2.376) | (2.447) | (2.089) | (2.091) | (1.703) |
| MTB | | 0.2193*** | 0.2700*** | 0.1089** | 0.1106** | 0.0692 |
| | | (0.055) | (0.059) | (0.051) | (0.051) | (0.043) |
| Size | | 0.1567*** | 0.1353*** | 0.1203*** | 0.1126*** | 0.0511*** |
| | | (0.025) | (0.026) | (0.023) | (0.023) | (0.017) |
| LVG | | -0.1062 | -0.1319 | -0.0640 | -0.0725 | -0.0798 |
| | | (0.258) | (0.273) | (0.238) | (0.239) | (0.195) |
| ROA | | -1.3575 | -1.0707 | 1.5115 | 1.3756 | 1.7387 |
| | | (2.704) | (2.930) | (2.402) | (2.401) | (2.023) |
| D.ROA | | -16.2163*** | -15.0549*** | -13.3996*** | -13.3474*** | -8.6932*** |
| | | (2.560) | (2.622) | (1.981) | (1.979) | (1.918) |
| Earnings variation | | | -15.4496*** | -13.7121*** | -13.6551*** | -7.5301** |
| | | | (4.214) | (3.564) | (3.570) | (3.138) |
| ILLIQ | | | | -7.2625** | -7.8736** | -7.3574*** |
| | | | | (3.241) | (3.228) | (2.779) |
| Repurchases | | | | | 0.0005 | 0.0004 |
| | | | | | (0.000) | (0.000) |
| # 4-Qtr structure | | | | | | 2.7763*** |
| | | | | | | (0.090) |
| Constant | -0.7654 | 0.3270 | 0.6891* | -1.2827** | -1.2324** | -1.1199** |
| | (0.660) | (0.379) | (0.402) | (0.502) | (0.501) | (0.512) |
| N | 17,619 | 13,180 | 12,509 | 15,584 | 15,584 | 15,584 |
| R^2-pseudo | 0.0735 | 0.0786 | 0.0813 | 0.0826 | 0.0828 | 0.167 |
| Time series | 1973-2015 | 1973-2015 | 1974-2015 | 1974-2015 | 1974-2015 | 1974-2015 |

### 6.4.4. Alternative Peer Group Definitions

To test whether our results are sensitive to the definition of the peer group, we use two alternative industry classifications in this section. Firstly, we define a peer group as those firms belonging to the same four-digit SIC code, which gives us more narrowly defined peer group.[57] Secondly, we group peers according to their Fama and French 49 Industry Classifications, and this gives more broadly defined groups.[58] Peer group sizes vary a lot when using industry classifications (Kaustia & Rantala, 2015), so in Table 6.4.4 we provide an overview of peer group sizes for our alternative definitions, including our baseline three-digit SIC code definition. The table gives a statistic summary of the average group sizes of the different definitions and the group sizes at different percentiles. The interval between the 1st and 99th percentiles shows the extent to which group sizes can vary for the different industry classifications. For the four-digit SIC code, the group size interval is from 1-24, and it is 1-28 for the three-digit SIC code. The corresponding interval for the Fama and French 49 Industry Classification is 1-119, thus showing a much larger dispersion between the largest and smallest group sizes. The average group sizes give an indication of how many peers a typical firm has in our sample under the different peer group definitions. Again, the Fama and French 49 definition differs significantly from the other definitions of peer groups in terms of average group size.[59]

[57] The four-digit SIC code groups firms into more specific product categories than the three-digit SIC code, meaning that we get more but smaller groups when using this definition. For example, two firms with four-digit SIC codes 3490 and 3491 would be peers using the three-digit SIC code (349), but they are in separate peer groups with the four-digit code.

[58] The Fama and French 49 Industry Classification groups firms according to their four-digit SIC code, but it defines them much more broadly than the three-digit industry code level.

[59] Generally, the Fama and French 49 classification is not an ideal peer group definition, as it seems implausible that a firm would be considering 27 firms as peers. Hence, the regression model with this peer group definition is merely a robustness test, and not considered a valid alternative.

**Table 6.4.4**

Group Size Statistics

The table shows summary statistics for the different industry classifications we use to define peer groups.

| Statistics | Three-digit SIC Code | Four-digit SIC Code | Fama and French 49 Industry Classification |
|---|---|---|---|
| Average group size | 7.2 | 3.3 | 26.95 |
| 1st percentile | 0 | 0 | 1 |
| 5th percentile | 0 | 0 | 3 |
| 25th percentile | 2 | 0 | 10 |
| Median | 4 | 1 | 21 |
| 75th percentile | 9 | 4 | 35 |
| 95th percentile | 20 | 14 | 81 |
| 99th percentile | 28 | 24 | 118 |

In Table 6.4.5, we undertake the same analysis as in the baseline, except that we use the four-digit SIC code as the definition of a peer group.[60] The results show that peer adoptions have no significant effect on the probability that the firm follows the structure. In fact, while the Peer Ratio was significant in all specifications in the baseline model, it ceases to be significant in specification (2) in table 6.4.5. The control variables are identical to the baseline model in terms of sign and significance, only difference being that illiquidity is negative and significant in Table 6.4.5. Taken together, our results are not robust to using this more narrowly defined peer group definition.

In Appendix Table 6.4.3, we show the results when using the Fama and French 49 Industry Classification as peer group definition. From this we see that the Peer Ratio is significant at the one percent level in all specifications. This shows that our baseline results are robust to the use of very large peer groups, which further supports Hypothesis 3. The control variables are qualitatively identical to the baseline model with this peer group definition, except that Size is significant at the one percent level in all specifications. The two alterations of the peer group definition both contrast and support our baseline results, and our results are thus sensitive to how we define peer groups. This exemplifies that the choice of peer group

[60] This affects the Peer Ratio, as we here measure the ratio of four-quarter increases over total increases for the firms that have the same four-digit SIC industry classification from period t-4 to t-1.

definition can have important implications in studies of peer effects. In the discussion of our results for Hypothesis 3, we compare the merits and drawbacks of the different classifications and discuss the use of industry classifications in general relative to alternative methods for group definitions.

**Table 6.4.5**

Four-quarter Structure and Peer Effects – Defining Peers by Four-digit SIC Codes

The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. The dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. We further control for announcement year- and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Peer Ratio | 0.1977*** | 0.1109 | 0.0975 | 0.1056 | 0.1053 | 0.0520 |
| | (0.070) | (0.075) | (0.078) | (0.079) | (0.079) | (0.068) |
| D. rel. div. | -1.2094*** | -1.0989*** | -1.0684*** | -1.0776*** | -1.0778*** | -0.5399*** |
| | (0.127) | (0.138) | (0.142) | (0.142) | (0.142) | (0.126) |
| Div. Yield | -10.2858*** | -7.8186*** | -6.1850** | -5.6376** | -5.6679** | -7.6038*** |
| | (1.907) | (2.390) | (2.459) | (2.525) | (2.528) | (2.075) |
| MTB | | 0.2308*** | 0.2815*** | 0.2809*** | 0.2820*** | 0.1819*** |
| | | (0.055) | (0.059) | (0.060) | (0.060) | (0.049) |
| Size | | 0.1560*** | 0.1344*** | 0.1211*** | 0.1166*** | 0.0546** |
| | | (0.025) | (0.026) | (0.029) | (0.030) | (0.022) |
| LVG | | -0.1025 | -0.1310 | -0.1552 | -0.1570 | -0.1674 |
| | | (0.257) | (0.272) | (0.276) | (0.276) | (0.225) |
| ROA | | -1.4646 | -1.1250 | -1.4594 | -1.5220 | -0.3631 |
| | | (2.718) | (2.939) | (2.995) | (3.003) | (2.492) |
| D. ROA | | -16.4723*** | -15.2689*** | -15.6880*** | -15.6624*** | -9.2274*** |
| | | (2.573) | (2.633) | (2.709) | (2.707) | (2.649) |
| Earnings variation | | | -15.9485*** | -15.9950*** | -15.9875*** | -6.6512* |
| | | | (4.257) | (4.287) | (4.291) | (3.659) |
| ILLIQ | | | | -5.6690 | -6.0925 | -6.0380* |
| | | | | (4.153) | (4.164) | (3.617) |
| Repurchases | | | | | 0.0002 | 0.0001 |
| | | | | | (0.000) | (0.000) |
| # 4Qtr | | | | | | 2.7583*** |
| | | | | | | (0.096) |
| Constant | -0.7603 | 0.3626 | 0.7332* | 0.7292* | 0.7552* | 0.6511* |
| | (0.661) | (0.383) | (0.407) | (0.423) | (0.424) | (0.382) |
| N | 17,619 | 13,180 | 12,509 | 12,142 | 12,142 | 12,142 |
| R^2-pseudo | 0.0720 | 0.0773 | 0.0801 | 0.0794 | 0.0795 | 0.172 |
| Time series | 1962-2015 | 1973-2015 | 1973-2015 | 1974-2015 | 1974-2015 | 1974-2015 |

### 6.4.5. Alternative Regression Model

In this section, we test the robustness of the baseline model results using a different regression model. Building on the framework of Andres and Hofbaur (2017), we generally use the logit regression model in our analyses. To see whether the results are similar in a different regression model, we compare the significant results of our baseline model with a linear probability model.[61] In Table 6.4.6, we apply a OLS regression model and build up the analysis in line with the baseline model in terms of adding control variables.

In Table 6.4.6, we see a similar pattern as in the baseline model, that the Peer Ratio variable is positive and significant at the one percent level in specification (1) to (5). Furthermore, the peer adoption variable is positive and significant at the five percent level in specification (6). Thus, our result in terms of significance is parallel to the baseline model and. Consequently, our results are robust to the use of an OLS model, and the findings in this section support Hypothesis 3. In terms of the control variables, these most develop as in the baseline model. However, in model specification (6), when adding the persistence in following a four-quarter structure, Earnings variation losses significance and ILLIW becomes significant at the five percent level. In general though, the logit and OLS models yield qualitatively similar results.

Comparing the marginal effect to that of the other variables in specification (6), we see that the effect of the Peer Ratio on the probability of adoption is slightly lower than that of the most significant explanatory variables[62]. We see that a one standard deviation change in the Peer Ratio increases the probability of adoption by 1.25%. In comparison, the corresponding one standard deviation increase for MTB has an effect of 2.55% on the probability of adoption, and for Size it is 2.30%. For the variables that negatively affect the probability of adoption, the relative change in dividends has an impact of -2.51%, D.ROA decreases the probability of -1.98%, while for Earnings variation the effect is -0.01%.

[61] There are disadvantages of using OLS for probability estimations (Stock & Watson, 2015), but it suffices for a robustness test and furthermore facilitates an interpretation of marginal effects.

[62] To facilitate comparison between variables, we multiply the marginal effect at the means by the standard deviation of the variable as in the baseline model.

## Table 6.4.6

Four-quarter Structure and Peer Effects – Linear Probability Model

The table shows the result of regressions of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. In the table, we use a linear probability model, where we regress the dummy variable *4-Qtr Structure t+4Q* on the firm characteristics variables. The *4-Qtr Structure t+4Q* variable is equal to one if the firm increases its dividend in t, and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. We further control for announcement year- and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Peer Ratio | 0.0887*** | 0.0767*** | 0.0697*** | 0.0689*** | 0.0689*** | 0.0370** |
| | (0.017) | (0.019) | (0.019) | (0.019) | (0.019) | (0.016) |
| D. rel. div. | -0.2568*** | -0.2320*** | -0.2261*** | -0.2280*** | -0.2280*** | -0.1191*** |
| | (0.024) | (0.027) | (0.027) | (0.027) | (0.027) | (0.025) |
| Div. yield | -2.2472*** | -1.7531*** | -1.3932*** | -1.2665** | -1.2701** | -1.5818*** |
| | (0.413) | (0.519) | (0.536) | (0.550) | (0.551) | (0.431) |
| MTB | | 0.0445*** | 0.0544*** | 0.0546*** | 0.0547*** | 0.0295*** |
| | | (0.011) | (0.012) | (0.012) | (0.012) | (0.009) |
| Size | | 0.0350*** | 0.0302*** | 0.0271*** | 0.0266*** | 0.0108** |
| | | (0.005) | (0.006) | (0.006) | (0.007) | (0.005) |
| LVG | | -0.0290 | -0.0349 | -0.0397 | -0.0400 | -0.0232 |
| | | (0.057) | (0.060) | (0.061) | (0.061) | (0.047) |
| ROA | | -0.2647 | -0.1815 | -0.2576 | -0.2648 | 0.1165 |
| | | (0.584) | (0.628) | (0.639) | (0.640) | (0.503) |
| DROA | | -3.4318*** | -3.2040*** | -3.3031*** | -3.3003*** | -2.1107*** |
| | | (0.551) | (0.568) | (0.584) | (0.584) | (0.535) |
| Earningsvariation | | | -3.3624*** | -3.3801*** | -3.3792*** | -1.2500 |
| | | | (0.916) | (0.924) | (0.925) | (0.767) |
| ILLIQ | | | | -1.3180 | -1.3650 | -1.7813** |
| | | | | (0.848) | (0.853) | (0.734) |
| Repurchases | | | | | 0.0000 | -0.0000 |
| | | | | | (0.000) | (0.000) |
| # 4-Qtr Structure | | | | | | 0.4460*** |
| | | | | | | (0.016) |
| Constant | 0.3379*** | -0.0197 | -0.0189 | 0.1144 | 0.1178 | 0.1041 |
| | (0.107) | (0.029) | (0.030) | (0.075) | (0.076) | (0.079) |
| N | 17,619 | 13,186 | 12,515 | 12,154 | 12,154 | 12,154 |
| R-squared | 0.097 | 0.103 | 0.106 | 0.106 | 0.106 | 0.200 |
| Time Period | 1962-2015 | 1973-2015 | 1973-2015 | 1974-2015 | 1974-2015 | 1974-2015 |

### 6.4.6. Restrictive Definition of the Four-quarter Structure

As in section 6.2, we challenge the definition of what defines a four-quarter structure in this analysis as well. We therefore test the robustness of our baseline findings by changing the definition of the four-quarter structure. As discussed in section 5.1, we question whether using the unrestricted definition suffices to justify that firms are following a four-quarter structure. This is especially problematic in this analysis, as the dependent variable proxies for the firm's decision. When the Adoption variable takes the value of one in t+4Q, this indicates that the firm decides to follow the structure at time t. However, the coincidental nature of the one-time four-quarter increases makes it hard to justify that the firm decides to follow the structure at t. To remove these coincidental adoption decisions, we therefore make the analysis with the restrictive definition of the four-quarter structure.

This has certain implications in terms of how we measure the probability of adoption. The dependent variable is now equal to one if the firm increases its dividend according to four-quarter intervals for the second time at t+4Q.[63] This addresses the problem of coincidental increases, as it imposes the requirement that the increase be part of a sequence of increases. For the Peer Ratio, the use of the restrictive definition implies that we measure the ratio of dividend increases that follow this restrictive definition over total increases. Furthermore, the variable #4-Qtr structure measures the number of times that the firm has previously followed this restrictive definition. We otherwise build up the model specifications as in the baseline model. Appendix Table 6.4.2 shows correlations between the variables included in this analysis.

From Table 6.4.7, we see that the Peer Ratio remains significant at the one percent level in all specifications. It is thus almost identical to the baseline model in terms of significance, only difference being that the coefficient in specification (6) is significant at the one percent instead of the five percent level. The baseline results are thus robust to using this restrictive

[63] This means that the 2-Year 4-Qtr. structure variable takes the value of one in t+4Q. This happens when a firm has already increased dividends in t-4Q and t, and then increases dividends again at time t+4Q. Alternatively, we could have said that the variable takes the value of one if the firm increases its dividend in t+4Q and t+8Q. The purpose of the restriction is to remove coincidental adoptions. In the discussion section we touch upon alternative ways to restrict the definition even further.

definition, and this further supports Hypothesis 3 that peer adoptions increase the likelihood of four-quarter adoption for the firm.

With respect to the control variables, there are some differences compared to when we use the unrestricted definition in the baseline. The dividend yield, which was significant at the one percent level throughout the baseline model, ceases to be significant in specification (3), but turns out to be significant at the five percent level in specification (6). A remarkable difference is the formerly insignificant ILLIQ variable, which is negative and significant at the one percent level in all specifications. Furthermore, Repurchases is significant at the ten percent level, indicating that firms who repurchase stock are more likely to adopt the four-quarter structure. As for the minor changes, Earnings variation is more significant in specification (6) than in the equivalent step in the baseline, and ROA is positive in Table 6.4.7. All other control variables are identical to the baseline model in terms of sign and significance.

## Table 6.4.7

Four-quarter Structure and Peer Effects – Restrictive Four-quarter Structure Definition

The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. The dependent variable is set to one if the firm increases its dividend in t-4Q, t and t+4Q, and zero otherwise. We further control for announcement year- and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Peer Ratio | 0.5516*** | 0.4857*** | 0.4389*** | 0.4354*** | 0.4328*** | 0.2892*** |
| | (0.090) | (0.100) | (0.102) | (0.102) | (0.102) | (0.094) |
| D. rel. div. | -2.6911*** | -2.2653*** | -2.1925*** | -2.1440*** | -2.1509*** | -1.2286*** |
| | (0.233) | (0.233) | (0.237) | (0.233) | (0.235) | (0.174) |
| Div. yield | -10.0050*** | -5.4824* | -4.3911 | -3.2335 | -3.3271 | -5.5331** |
| | (2.243) | (2.852) | (2.909) | (2.952) | (2.954) | (2.292) |
| MTB | | 0.2470*** | 0.3011*** | 0.3064*** | 0.3096*** | 0.1997*** |
| | | (0.058) | (0.063) | (0.063) | (0.064) | (0.051) |
| Size | | 0.2047*** | 0.1794*** | 0.1486*** | 0.1370*** | 0.0567** |
| | | (0.029) | (0.029) | (0.033) | (0.033) | (0.023) |
| LVG | | -0.1237 | -0.0792 | -0.0964 | -0.1005 | -0.0322 |
| | | (0.286) | (0.303) | (0.304) | (0.305) | (0.239) |
| ROA | | 0.5204 | 1.5367 | 1.4887 | 1.3286 | 4.4121 |
| | | (3.141) | (3.488) | (3.545) | (3.560) | (2.721) |
| D. ROA | | -26.5825*** | -26.5100*** | -26.8840*** | -26.8146*** | -21.6089*** |
| | | (2.735) | (2.902) | (2.966) | (2.964) | (2.923) |
| Earnings variation | | | -21.4501*** | -22.1775*** | -22.1561*** | -9.3312** |
| | | | (5.027) | (5.063) | (5.078) | (4.103) |
| ILLIQ | | | | -19.4599*** | -20.8153*** | -21.0712*** |
| | | | | (7.055) | (7.149) | (5.758) |
| Repurchases | | | | | 0.0004 | 0.0005* |
| | | | | | (0.000) | (0.000) |
| # 4-Qtr structure | | | | | | 4.1644*** |
| | | | | | | (0.115) |
| Constant | 0.6553*** | -1.1585*** | -0.8131** | -0.6022 | -0.5295 | -0.6787* |
| | (0.215) | (0.376) | (0.389) | (0.406) | (0.406) | (0.347) |
| N | 19,474 | 13,180 | 12,509 | 12,142 | 12,142 | 12,142 |
| R^2-pseudo | 0.0974 | 0.117 | 0.121 | 0.123 | 0.123 | 0.292 |
| Time series | 1973-2015 | 1973-2015 | 1974-2015 | 1974-2015 | 1974-2015 | 1974-2015 |

### 6.4.7. Peer Effects at the First Four-quarter Adoption

To address this possibility, we make a regression analysis equivalent to the baseline model but with a restricted sample. Specifically, for the firms that ultimately adopt the structure, we exclude the observations after the first adoption[64] of the four-quarter structure. The analysis thus implicitly assumes that any post-adoption variation is involuntary, in the sense that the firm wants to follow the structure after its first adoption. Removing this post-adoption variation should theoretically give a cleaner setting in terms of understanding why the firms *want* to follow the structure.

Appendix Table 6.4.4 shows that there are no peer effects when making this sample restriction.[65] The Peer Ratio is insignificant in all specifications, and even negative in all specifications except the second one. However, it is not only the Peer Ratio that is insignificant. The relative increase in dividends and Earnings variation are insignificant as well, although their signs are negative as in the baseline model. Moreover, MTB is insignificant in all specifications. Leverage, on the other hand, is now statistically significant at the five percent level. Illiquidity, which was previously negative and insignificant, exhibits a positive yet still insignificant impact on the probability of adoption. All other control variables are qualitatively indifferent from the baseline mode. In conclusion, the results from the baseline model are thus not robust to this sample restriction.

### 6.4.8. Addressing Concerns for Discriminant Validity

As in section 6.3, we consider threats to discriminant validity from using the # 4-Qtr. structure. Hence, we apply two alternative measures of persistence in following the four-quarter structure. In Table 6.4.8, we use the two alternative measures in both the restricted and unrestricted setting. We see that the Peer Ratio is positive and significant through all specifications. In specification (1) and (3), the Peer Ratio is significant at the five percent level

[64] This first adoption time is the first firm-quarter in which the 4-Qtr. structure variable in t+4Q takes the value of one, according to the assumption that the firm decides in t to follow the structure by increasing its next dividend four-quarters ahead. For example, if a firm increases its dividend in Q2 2005 and in Q2 2006, then Q2 2005 is the time at which the decision is made. All firm-quarter observations after this are excluded from the sample.

[65] With this definition, the dependent variable and the Peer Ratio are exactly as in the baseline definition. The only difference is that there are far fewer observations, as firms only adopt once. The measure of persistence, the #4-Qtr. structure is excluded, as there are no prior observations according to this definition.

when using the Total past adoptions variable[66]. In specification (2) and (4), the Peer Ratio is significant at the one percent level when using the Post-4QRS variable[67]. This result supports our previous findings for Hypothesis 3, and the # 4-Qtr. structure variable does not seem to compromise the discriminant validity of our results. In terms of the control variables, we see that the two dividend variables, MTB, D.ROA and the substitutes for the # 4-Qtr. Structure variable are significant at the one percent level in all specifications. Leverage, ROA and Repurchases are insignificant through all specifications. Earnings variation is insignificant in specification (1) and significant in specification (2) to (4). This pattern is very much in line with the previous findings. Size and Illiquidity differ somewhat from the baseline model. Size is insignificant in specification (1), (3) and (4) and significant at the five percent level in specification (2). Illiquidity is significant at the five percent level in specification (1), turns insignificant in specification (2) before becoming significant at the one percent level in specification (3) and (4). There seems to be an inverse relation between whether firm size and illiquidity are significant. This might be due to the high negative correlation between IllIQ and Size, which under both definitions of the four-quarter structure is more than 0.243. Bigger firms are typically traded more than smaller firms. In conclusion, while some control variables develop differently with alternative measures of persistence, the Peer Ratio remains significant with all alternative variables. Like in section 6.3, the # 4-Qtr. structure variable does not seem to be explaining the same as the dependent variable.

[66] The variable Total past adoptions accumulates all the previous times firm i has adopted the four-quarter structure. Compared to # 4-Qtr Structure, Total past adoptions does not only calculate the consecutive four-quarter adoptions but all adoptions for firm i.

[67] Post-4QRS is an indicator variable that takes the value of one for all periods following and incluing T and zero otherwise. T is defined as the first period where the 4-Qtr. structure equals one.

## Table 6.4.8

Four-quarter Structure and Peer Effects – Addressing Discriminate Validity Concerns

The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. In specification (1) and (2), the dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. In specification (3) and (4), The dependent variable is set to one if the firm increases its dividend in t-4Q, t and t+4Q, and zero otherwise. We further control for announcement year- and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Peer Ratio | 0.1855** | 0.2736*** | 0.2577** | 0.3468*** |
| | (0.083) | (0.084) | (0.101) | (0.099) |
| D. rel. div | -0.5285*** | -0.7836*** | -1.1445*** | -1.4907*** |
| | (0.137) | (0.143) | (0.178) | (0.193) |
| Div. yield | -10.6993*** | -8.3547*** | -9.7742*** | -7.5443*** |
| | (2.202) | (2.382) | (2.450) | (2.595) |
| MTB | 0.1838*** | 0.2699*** | 0.1994*** | 0.2774*** |
| | (0.058) | (0.059) | (0.063) | (0.063) |
| Size | 0.0075 | 0.0686** | -0.0015 | 0.0510 |
| | (0.026) | (0.029) | (0.028) | (0.032) |
| LVG | -0.2341 | 0.0341 | -0.1944 | -0.0665 |
| | (0.249) | (0.267) | (0.273) | (0.283) |
| ROA | -0.8605 | -1.9188 | 3.1577 | 1.5276 |
| | (2.817) | (2.930) | (3.297) | (3.446) |
| D.ROA | -12.8821*** | -14.1039*** | -24.5997*** | -25.3862*** |
| | (2.682) | (2.749) | (3.072) | (3.063) |
| Earnings variation | -7.0104 | -11.4813*** | -10.8952** | -14.6069*** |
| | (4.402) | (4.265) | (5.208) | (5.041) |
| ILLIQ | -9.8515** | -1.7660 | -22.3037*** | -16.9405*** |
| | (3.991) | (4.098) | (6.548) | (6.458) |
| Repurchases | -0.0001 | 0.0002 | 0.0003 | 0.0005 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Total past adoptions | 0.1106*** | | 2.0083*** | |
| | (0.008) | | (0.100) | |
| Post-4QRS | | 0.8563*** | | 1.4017*** |
| | | (0.082) | | (0.080) |
| Constant | 1.2259*** | 0.4081 | -0.0259 | -0.6089 |
| | (0.395) | (0.417) | (0.393) | (0.399) |
| N | 12,142 | 12,142 | 12,142 | 12,142 |
| R^2-pseudo | 0.126 | 0.0983 | 0.203 | 0.176 |
| Time series | 1974-2015 | 1974-2015 | 1974-2015 | 1974-2015 |
| Measure of 4-Qtr structure | Unrescricted | Unrescricted | Restricted | Restricted |

The preceding robustness tests are related to methodological choices, and they predominantly support the baseline model test of Hypothesis 3. In the following robustness tests, we address the endogeneity concerns that are inherent in studies of social effects, as explained in section 5.4. Specifically, we analyze whether unobserved factors at the peer group level affect the decision to follow the structure. If the Peer Ratio is merely proxying for common factors that increase the likelihood of adoption, the controls we include for these factors should drive out the effect of the Peer Ratio. In these endogeneity robustness tests, we apply both the unrestricted and restricted definitions of the four-quarter structure.[68] We do this to accommodate different perceptions of what justifies as a proxy for firm adoption of the four-quarter structure. In doing so, we both facilitate a comparison with previous research[69] and allow for the possibility that a stricter definition is required to justify a proxy for an active dividend structure policy.[70] This should allow for research to build on either or both these definitions depending on methodological conviction.

### 6.4.9 Peer Group Level Persistence in Following the Four-quarter Structure

A remaining threat to the validity of our results is the possibility of group specific shocks affecting the likelihood of four-quarter adoption. We now want to control for group level persistence in following the structure, to see whether the current extent of adoptions in the peer group is high compared to historical levels. We build up Table 6.4.9 in the same way as Table 6.4.8 and look at both the unrestricted and restricted definition of a four-quarter structure. In addition, group-level historic tendencies in adoption activity, as explained in section 5.4.

In Table 6.4.9 we use the unrestricted definition in specifications (1) and (2). The Peer Ratio is significant in specification (1), but it turns insignificant in specification (2). As for the variables accounting for the historical levels in peer adoptions, we see that the Peer 5-year

[68] In all regression tables, we thus indicate which definition each specification follows. We omit the consistent adoption definition, as this gave no indication of peer effects.
[69] Ultimately, when we include industry fixed effects, our regression model becomes directly comparable to the probit analysis in Andres and Hofbaur (2017).
[70] We thus consider both definitions valid, and leave it open to the reader to interpret the results in accordance with one's perception of the adequacy of the two definitions.

History variable is insignificant, and that the Peer 10-year History variable is significant at the five percent level. Specification (2) thus suggests that when accounting for the history of peer adoptions, the most recent adoption is less decisive for the firm. The results for the unrestricted definition do not support our expectations. When using the restrictive definition in specifications (3) and (4), the Peer Ratio is significant at the one percent level in specification (3) and at the five percent level in specification (4). This indicates that when excluding coincidental adoptions, the results are robust to controls for past adoptions. Using the restricted definition, we thus find that the results are robust to peer group persistence in following the four-quarter structure.

Looking at the other control variables, we see that the two dividend variables, MTB, Size, D.ROA and # 4-Qtr. structure are all significant in specification (1) to (4), while LVG is insignificant in all specifications. ILLIQ and Repurchases are insignificant under the unrestricted definition and significant under the restricted definition. Earnings variation is significant in all specification except in model specification (2). The result for the control variables for specifications (1) and (2) are very much in line with specification (6) in the baseline model. Furthermore, the results in specifications (3) and (4) are parallel to specification (6) in Table 6.4.7, where we first used the restricted definition of the four-quarter structure. For the first time, ROA becomes positive and significant at the ten percent level in specification (4). In summary, our control variables are generally insensitive to the control for peer group-level historic tendencies in adoption activity.

## Table 6.4.9

Four-quarter Structure and Peer Effects – Controlling for Group Level Persistence
The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. In specification (1) and (2), the dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. In specification (3) and (4), The dependent variable is set to one if the firm increases its dividend in t-4Q, t and t+4Q, and zero otherwise. We control for announcement year and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| PeerRatio | 0.1760** | 0.1113 | 0.3015*** | 0.2363** |
| | (0.083) | (0.080) | (0.108) | (0.106) |
| D. rel. div. | -0.5321*** | -0.5254*** | -1.2215*** | -1.2133*** |
| | (0.126) | (0.125) | (0.176) | (0.176) |
| Div. Yield | -7.6547*** | -7.6453*** | -5.7192** | -5.7238** |
| | (2.070) | (2.061) | (2.314) | (2.311) |
| MTB | 0.1754*** | 0.1727*** | 0.2015*** | 0.1985*** |
| | (0.049) | (0.049) | (0.051) | (0.051) |
| Size | 0.0552** | 0.0537** | 0.0589** | 0.0576** |
| | (0.022) | (0.022) | (0.024) | (0.024) |
| LVG | -0.1682 | -0.1828 | -0.0373 | -0.0441 |
| | (0.227) | (0.228) | (0.236) | (0.237) |
| ROA | -0.3649 | -0.3050 | 4.4650 | 4.5900* |
| | (2.484) | (2.477) | (2.736) | (2.735) |
| D. ROA | -9.1288*** | -9.0747*** | -21.7337*** | -21.7504*** |
| | (2.645) | (2.639) | (2.926) | (2.925) |
| Earnings variation | -6.0947* | -5.8529 | -8.8657** | -8.6833** |
| | (3.628) | (3.619) | (4.132) | (4.138) |
| ILLIQ | -5.8331 | -5.8371 | -20.6007*** | -20.6330*** |
| | (3.616) | (3.622) | (5.712) | (5.732) |
| Repurchases | 0.0001 | 0.0001 | 0.0005* | 0.0005** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| # 4-Qtr structure | 2.7477*** | 2.7443*** | 4.1755*** | 4.1721*** |
| | (0.096) | (0.096) | (0.115) | (0.115) |
| Peer 5-year History | 0.0550 | | 0.0008 | |
| | (0.127) | | (0.147) | |
| Peer 10-year History | | 0.2984** | | 0.2114 |
| | | (0.146) | | (0.181) |
| Constant | 0.5604 | 0.4937 | -0.6614* | -0.6879* |
| | (0.377) | (0.377) | (0.351) | (0.353) |
| N | 12,142 | 12,142 | 12,061 | 12,061 |
| R^2-pseudo | 0.172 | 0.173 | 0.293 | 0.293 |
| Time series | 1974-2015 | 1974-2015 | 1974-2015 | 1974-2015 |
| Measure of 4-Qtr structure | Unrestricted | Unrestricted | Restricted | Restricted |

### 6.4.10. Industry Fixed-Effects

In our final robustness test for Hypothesis 3, we address the concern for peer group-specific unobserved factors by using industry fixed-effects. The Peer Ratio should become insignificant upon including this control if it were simply proxying for common peer group factors that increase the likelihood of adoption. As explained in section 5.4, we would ideally control for the specific peer group that the firm is part of, which in our case is the three-digit SIC code. However, the relation between this industry classification and the Peer Ratio impedes our ability to use it as a fixed-effect. In Appendix Table 6.4.5, we show the results of a regression model when we use the three-digit SIC code as industry fixed-effect. This makes the Peer Ratio coefficient flip and become negatively significant[71]. Therefore, we rely on less closely related industry definitions as approximations to a control for unobserved peer group heterogeneity.

When we use other industry fixed-effects than the three-digit SIC code, the relation between our peer groups the industry classification can never be one-to-one. Hence, the weaker the relation between our fixed-effect industry classification and the three-digit classification, the harder it becomes to capture peer group specific effects.[72] On the other hand, it becomes easier to interpret the effect of including industry fixed-effects when it is more broadly defined than the three-digit SIC code.[73] As there are merits and drawbacks of the different industry fixed-effects, we apply three alternatives as controls in Table 6.4.10. In summary, we cannot perfectly capture peer group effects, but use alternative industry classifications to addresses the problem.

Table 6.4.10 use three different industry fixed-effects to account for the threat of unobserved group factors. All specifications in the model are similar to specification (6) in the baseline

[71] In untabulated results, we verify that the coefficient also becomes negatively significant when we only include the Peer Ratio along with time- and three-digit industry fixed effects.
[72] For instance, when using a two-digit SIC classification as fixed-effect, this captures between-industry variation for this level of the SIC hierarchy. However, a two-digit SIC classification potentially comprises several three-digit classifications, and thus cannot accurately control for factors that control for the specific three-digit peer group.
[73] The two-digit SIC code might still be affected by the resemblance with the Peer Ratio, and if this is the case the effect of this control on the entire regression model is distorted by this relation. This is less of a problem with the Fama and French 12 Industry Classification, which groups firms into very broad industry definitions.

model in terms of the variables we include. Specifications (1) to (3) use the unrestricted definition four-quarter structure, whereas specification (4) to (6) use the restricted definition of the structure. For both definitions of the four-quarter structure, we apply the two-digit SIC code, Fama and French 49- and 12 Industry Classifications in this sequence.

In Table 6.4.10, we see how the significance of the Peer Ratio variable changes when we control for industry fixed-effects. In specifications (1) to (3), with the unrestricted definition, there is little evidence of peer effects. The Peer Ratio is positive but insignificant in specifications (1) and (2), and significant at the ten percent level in specification (3). In specification (4) to (6), with the restricted definition, there is more evidence of peer effects. The Peer Ratio is still insignificant when we use the two-digit SIC classification in specification (4), but it is significant at the ten percent and five percent level, respectively, in specifications (5) and (6). Consequently, the results in Table 6.4.10 show mixed support for Hypothesis 3.

In terms of the control variables, they exhibit some differences compared to the baseline model. With the unrestricted definition, most variables corroborate the results of the baseline model. The only exceptions are Earnings variation, which is insignificant, and illiquidity, which is now significant. Under the restrictive definition, ROA and Repurchases are not only positive but also significant. This suggests that firms with a high return on assets and those that repurchases shares are more likely to follow the structure. Illiquidity is negatively significant at the one percent level, indicating that firms who are frequently traded are more likely to adopt the structure. Apart from these, the remaining control variables in the restricted definition resemble those in Table 6.4.7, where we also used the restricted definition. The change in the control variables shows that these, just as the Peer Ratio, are sensitive to the use of industry fixed-effects.

## Table 6.4.10

Four-quarter Structure and Peer Effects – Industry Fixed-Effects

The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. In specification (1) to (3), the dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. In specification (3) and (4), The dependent variable is set to one if the firm increases its dividend in t-4Q, t and t+4Q, and zero otherwise. We control for announcement year and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| PeerRatio | 0.0107 | 0.0675 | 0.1487* | 0.0828 | 0.1740* | 0.2353** |
| | (0.083) | (0.079) | (0.078) | (0.102) | (0.098) | (0.097) |
| D. rel. div. | -0.5160*** | -0.4870*** | -0.5215*** | -1.2020*** | -1.1660*** | -1.1994*** |
| | (0.121) | (0.121) | (0.125) | (0.171) | (0.171) | (0.174) |
| Div. yield | -6.8001*** | -7.7848*** | -8.0045*** | -4.9072** | -6.1202*** | -6.2890*** |
| | (2.105) | (2.050) | (2.107) | (2.370) | (2.375) | (2.357) |
| MTB | 0.1048** | 0.0971* | 0.1370*** | 0.1498*** | 0.1317** | 0.1617*** |
| | (0.050) | (0.050) | (0.049) | (0.054) | (0.053) | (0.051) |
| Size | 0.0910*** | 0.0865*** | 0.0743*** | 0.0859*** | 0.0866*** | 0.0787*** |
| | (0.023) | (0.023) | (0.022) | (0.024) | (0.024) | (0.024) |
| LVG | -0.4135* | -0.3669 | -0.1770 | -0.3169 | -0.2727 | -0.1168 |
| | (0.225) | (0.226) | (0.229) | (0.243) | (0.244) | (0.244) |
| ROA | 0.2345 | 0.4339 | -0.1659 | 4.5376 | 5.0523* | 4.6802* |
| | (2.502) | (2.488) | (2.493) | (2.786) | (2.741) | (2.715) |
| D. ROA | -8.2101*** | -8.2463*** | -8.6154*** | -20.8112*** | -21.0606*** | -21.3747*** |
| | (2.669) | (2.661) | (2.636) | (3.006) | (3.028) | (2.965) |
| Earnings variation | -3.1765 | -1.3713 | -4.8921 | -7.2102* | -4.7314 | -7.5310* |
| | (3.752) | (3.644) | (3.677) | (4.223) | (4.137) | (4.127) |
| ILLIQ | -6.8812* | -6.6250* | -6.3546* | -21.5820*** | -21.5889*** | -20.9933*** |
| | (3.730) | (3.666) | (3.641) | (5.806) | (5.841) | (5.715) |
| Repurchases | 0.0002 | 0.0001 | 0.0001 | 0.0007** | 0.0005* | 0.0005** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| # 4-Qtr structure | 2.6166*** | 2.6625*** | 2.7069*** | 4.0512*** | 4.0995*** | 4.1351*** |
| | (0.098) | (0.098) | (0.097) | (0.114) | (0.116) | (0.115) |
| Constant | -0.7887 | -1.4791 | 0.7082* | -1.6345** | -2.0471* | -0.5354 |
| | (0.712) | (0.963) | (0.390) | (0.757) | (1.087) | (0.372) |
| N | 12,134 | 12,115 | 12,142 | 12,041 | 12,034 | 12,061 |
| R^2-pseudo | 0.186 | 0.181 | 0.176 | 0.305 | 0.300 | 0.296 |
| Time series | 1974-2015 | 1974-2015 | 1974-2015 | 1974-2015 | 1974-2015 | 1974-2015 |
| Four-quarter structure | Unrestricted | Unrestricted | Unrestricted | Restricted | Restricted | Restricted |
| FE | 2 digit SIC | FF49 | FF12 | 2 digit SIC | FF49 | FF12 |

### 6.4.11. Discussion of Hypothesis 3

Hypothesis 3 posits that the probability of adopting the four-quarter structure is increasing as more peers adopt the structure. While our baseline results support Hypothesis 3, the robustness tests give more mixed evidence for the existence of peer effects. In this section, we interpret and discuss the results of the baseline and robustness tests. Furthermore, we discuss the merits and drawbacks of our methodological choices, to provide an assessment of how it affects the interpretations of our results. Based on this, we conclude on Hypothesis 3.

The baseline model supports the hypothesis, as the Peer Ratio is positive and significant at the five percent level. As the share of peers who follow the structure increases, the probability of adoption increases as well. The baseline results thus indicate that firms incorporate information about their peers' choices in deciding on whether to follow the structure. Following the herd behavior model by Banerjee (1992), this implies that firms infer from peer's decisions that these have superior information on whether following the structure is beneficial. Consequently, the more peers adopt the structure, the higher the probability that the firm adopts the structure. Our use of the Peer Dummy as an alternative measure of four-quarter adoption by peers supports this interpretation. The Peer Dummy only indicates peer adoption if the level of adoption is higher than that of the market. While the downside of this is that it disregards the effect of below-average adoptions, the benefit is that we better isolate the group-specific element of adoption activity. When only including Peer Ratios above the market average, we can better say that the firms we include react to their peer's decisions, and not to general market tendencies in adoption. In conclusion, both measures of peer adoption support Hypothesis 3.

While the above supports our hypothesis, there could possibly be alternative explanations for the behavior we observe. For example, a more conservative explanation as to why firms generally mimic their peers could be that they fear drawbacks from not doing so (Kaustia & Rantala, 2015). If peers have increasingly started following a four-quarter structure, the firm could simply follow this structure just to avoid standing out. In other words, firms might observe that peers are following the four-quarter structure and decide to follow it simply to avoid drawbacks. Such drawbacks could be that not following the structure when peers do so would make the firm seem less financially stable than its peers. Hence, while Banerjee (1992)

argues that herd behavior can be rational, the possibility exists that the herd behavior we observe is rather due to a fear of drawbacks.

Changing the peer group definitions tests whether our baseline results are robust to using alternative definitions of who the firm perceives as its peers. When using the narrower four-digit SIC definition, the Peer Ratio is insignificant. Under this definition, firms are categorized as peers based on a more detailed production description level. This might better capture peers that are related and observe each other's actions. For example, while the three-digit SIC code 110 covers beverage manufacturers, the four-digit codes 1102 and 1107 that fall under this category represent wine and soft-drinks, respectively. Hence, when using the 110 group to define peers, we disregard some differences between the firms in terms of their specific products. This could indicate that the four-digit SIC code is a more accurate peer group definition than the three-digit SIC.

On the other hand, we might be defining groups too narrowly with the four-digit SIC definition. When distinguishing between very specific product categories, we might be too restrictive in our grouping of firms. Even though the wine and soft-drink producers in the above example have different products, they might to some extent consider each other substitute products. In addition, we see from Table 6.4.4 that many observations do not have dividend-increasing peers under this definition of a peer group.[74] This might explain the lack of significance for the Peer Ratio. In conclusion, while the four-digit SIC code seems a valid alternative in terms of grouping firms based on product-relatedness, there is risk of grouping firms too narrowly and thereby failing to account for the broader sense of relatedness of the firms. Thus, while using this four-digit SIC code definition for peer groups questioned our results, it might be because the definition is too narrow.

The use of Fama and French 49 Industry Classifications as peer group definition further supported our baseline results. However, like the four-digit SIC, there are limitations to the use of this definition. The Fama and French 49 is very broad and gives enormous peer groups of over 100 firms occasionally. As seen in Table 6.4.4, the average group size is 27, implying

[74] Up until the 25th percentile, the peer group size is zero under this definition.

that an average firm considers 27 firms as related peer firms, whom it looks to for information inference. Based on the consensus on peer groups sizes in extant literature (Kaustia & Rantala, 2015), we reasoned from the outset that this classification was too broad to be a peer group definition. It seems unrealistic that firms would be considering that many peers on average, let alone trying to derive optimal decision-making from their actions. As for the four-digit SIC, the Fama and French 49 definition is merely included as a robustness test. We have not found other studies that use either of these as peer group definitions. However, the fact that our results were sensitive to this choice of group definition exemplifies that the choice can have important implications for determining whether there is evidence of social effects. In the following, we discuss alternative options for defining peer groups, to clarify the strengths and weaknesses of our general use of industry classification relative to alternatives. This should shed more light on the limitations of our results in terms of determining the existence of peer effects.

The choice of peer group definition is a critical methodological choice, as it has implications for the external acceptance of the inferences we make. If researchers are not aware of how individuals select into peer groups, then it is hard to justify that observed behavior follows from the actions of group effects (Manski, 1993). In studies of peer effects, there is need of a group of firms which are closely related and pay attention to one another. We used different industry classifications as robustness tests, but the literature on peer effects suggests several alternatives to industry classifications. In the following, we discuss some examples.

The SIC system remains the most popular industry classification system, since businesses and organizations have grown accustomed to the use of these. However, a the SIC code hierarchy groups firms based on product similarity, and this might not capture the extent to which the members perceive each other as related (Kaustia & Rantala, 2015). As an alternative, researchers of social effects can group firms based on the common equity analysts that cover them.[75] Kaustia and Rantala (2015) find that this method outperforms conventional industry classifications in making homogenous groups. Hence, this method seems to better document

[75] The method is based on analyst covering related stocks. Analysts' personal incentives entail that they tend to concentrate on a specific group of related firms.

that peer group members are related. Furthermore, Hoberg and Phillips (2015) provide a new method to group firms. They look at the firms' K-10 product descriptions, and group those who have similar product/service descriptions. They argue that these new industry classifications are more frequently updated and offer more research flexibility than traditional industry classifications. Thus, with more sophisticated methods of peer group definition, it is possible that our analysis could be enhanced in future research with better data availability.

We acknowledge the lack of granularity in relying on industry classifications such as SIC codes. Nonetheless, in line with Leary and Roberts (2014), we opt for the three-digit SIC group definition of peers. We argue that this definition of peers classifies firms into groups that face similar market conditions and competition for customers. Therefore, we consider it plausible that the firms' peers can be found within these groups because of their strategic similarity. Furthermore, as we rely on data throughout several decades, we need peer group definitions, which cover firms in all time-periods of the sample. The SIC code definition is superior in this regard, as the databases required for the other definitions do not go as far back in time. Hence, as the use of SIC classifications resembles previous methods, groups firm on strategic relatedness and covers the entire sample period, we rely on this as our definition of peer group.

As a final note on the measurement of peer effects, we briefly consider the choice of the timing of measuring peer effects. Building on the work of Andres and Hofbaur (2017), we are measuring firm four-quarter adoption at time t. The choice of when to measure peer four-quarter adoption relative to time t involves a tradeoff between being able to identify mimicking behavior and allowing for the possibility of confounding events. If the measure of peers following a four-quarter structure is too close to the time where firm i adopts, it is hard to argue that firm i would have had sufficient time to react to this decision. On the other hand, when extending the time interval between measuring peer adoption and firm adoption, there is an increasing risk that events unrelated to peer decisions will affect the decision to adopt a four-quarter structure for the firm (Leary & Roberts, 2014). Our measurement of peer actions resembles that of Kaustia and Rantala (2015), in that we aggregate information in the year prior to time t. In this way, firms will rely on the observations of peer adoption leading up to

time t. We thus avoid overlapping actions by peers and the firm and limit the influence by unrelated events.

When testing the sensitivity of our results to alternative definitions of a four-quarter structure, there is again mixed support for Hypothesis 3. Using the restricted definition, there is strong support of the baseline results. It could be that the unrestricted definition gives less significant results because it includes increases that firms would not consider as policies. For example, if the firm's peers at a given moment have recently only made one-time four-quarter increases, this might be insufficient evidence for the firm that the increases reflect an active policy. Thus, by including these increases in the calculation of the Peer Ratio in the unrestricted definition, we might have accounted for observations that do not affect the probability of adoption. Taken together, the restricted definition circumvents some concerns regarding the proxy for peer adoptions, and the significant results in this setting are thus strong support of Hypothesis 3.

Nonetheless, the dependent variable in this analysis still includes some coincidental adoptions. With the restrictive definition, the dependent variable takes the value of one if the firm increases its dividend in t+4Q and has previously increases dividends in t-4Q and t. This means that the increase in t+4Q is part of a sequence of four-quarter increases, as required, but it does not entail that the firm will continue this structure after t+4Q. Therefore, the dependent variable still has the limitation that it includes observations where the firm abandons the four-quarter structure just after t+4Q. We could have constructed the dependent variable such that it equaled one if the firm increases dividends in t+4Q and t+8Q, and thereby avoid the instance in which the firm abandons the structure just after t+4Q. However, even with this definition, we still do not ensure that the firm follows the structure after t+8Q, and the problem would continue if we imposed even further requirements for consecutive increases after time t.

Essentially, the only consistent adoptions of the four-quarter structure are those in which the firm adopts and never abandons the structure for the rest of the time it is part of the sample. By using only these, however, we would be eliminating a vast amount of observations from our sample. In that case, we might as well exclude observations where the firm has the intention to follow the structure but is not able to do it. The firm might abandon the structure temporarily simply for financial reasons. Hence, by imposing excessively strict requirements

for consecutiveness, we would risk eliminating too many observations. Moreover, we cannot methodologically define a threshold number of consecutive increases by which the firm can be said to have followed the structure. The restrictive definition has the merit of excluding coincidental observations, and that this by itself is a step towards better supporting the baseline results. In conclusion, while we acknowledge the limitation in our proxy for firm adoptions, the restrictive definition serves the purpose of testing the sensitivity of our results to an alternative four-quarter definition.

Our next robustness test excluded all four-quarter adoptions after the first adoption, and this showed no support of Hypothesis 3. Apart from the sample restriction of using only the first adoption for four-quarter firms, the analysis is equivalent to the baseline model. Thus, the fact that peer adoptions are insignificant in the model raises doubts of robustness of the baseline results. Indeed, one could argue that it is especially at the first adoption that peer adoptions would affect adoption by the firm. If a firm has previously followed the structure, it has experience in terms of when it is desirable to follow the structure. As a result, the firm has more experience to rely on. According to the herd model by Banerjee (1992), firms look to peers in the absence of convincing signals on what is optimal to do. Consequently, when firms have previously followed the structure, there should be less need of inferring knowledge from peer's decisions. Considering this, the insignificant results in this robustness test contrast Hypothesis 3 and raises doubts about the effect of peer adoptions.

However, other variables are sensitive to this sample restriction as well, as seen in Appendix Table 6.4.4. Hence, the sensitivity of the results from focusing only on the first adoption thus challenges not only our proposition that peer adoptions affect the probability. It further questions previous findings on the significant effect of the relative dividend change. Furthermore, like most tests of Hypothesis 3, this approach suffers from prevalence of coincidental adoptions. When including only the first adoption, we run the risk of including coincidental adoptions at the expense of actual adoption times.[76] We could have attempted to

[76] This would happen if the firm by coincidence increases dividends in Q1 2004 and Q1 2005, makes no equivalent four-quarter increases in years 2006 and 2007, and then consistently follows the four-quarter structure by increasing dividends every fourth quarter from, say, Q2 2009 and for the remainder of the sample period. In this case, our identification mechanism would select Q1 2004 as the adoption decision time, and not Q2 2009, although this is

make this analysis under the restrictive definition, to circumvent this problem, but for the ease of comprehension we limit the methodological robustness tests to only address one alteration at the time. In brief, while this robustness test questions the existence of peer effects, there are limitations to making this sample restriction, and we therefore do not consider it strong support against our results.

The previously discussed robustness tests concern our method, and our assessment is that they mostly support our results. The final two robustness tests concern endogeneity issues, more specifically the possibility that unobserved factors to the peer group affect the results. The control for historic tendencies for peers to follow the structure provides mixed evidence for Hypothesis 3. When using the unrestricted definition of the structure and the 10-Year History variable, the Peer Ratio is insignificant, while the history variable is significant. This implies that when accounting for the historic level of adoption in the peer group, the most recent adoptions do not increase the probability of adoption. The 10-Year History variable measures the Peer Ratio over a period of ten years, and this is a proxy for the general tendency to follow the structure in the peer group. A possible interpretation is that there are group-specific factors influencing the probability of adoption, and that the Peer Ratio was previously proxying for these factors. However, using the 5-Year History variable does not support this inference, as that coefficient is insignificant and has a small economic effect. It is surprising that we find such different impacts of alternative history variables. When using the restricted definition, the results show evidence of peer effects with both history variables. At the same time, both history variables are insignificant, suggesting that group-specific factors do not influence the probability of adoption. This again shows that there is solid support for Hypothesis 3 when using the restrictive definition. Taken together, the findings from controlling for historic tendencies to adopt the four-quarter structure predominantly support Hypothesis 3.

In our final robustness test for endogeneity concerns, we include industry fixed-effects in the analysis of peer effects. There are again mixed findings, and we see different results

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where the long-term structure decision is made. Ideally, we would be more interested in what happens in Q2 2009, but this drops out of the sample.

depending on the definition of the four-quarter structure. With both definitions of the four-quarter structure, there is modest evidence of peer effects when applying the Fama and French 12 Industry Classification. When using the narrower Fama and French 49 Industry Classification, the Peer Ratio is only significant using the restrictive definition. The results show that our baseline results are sensitive to the use of industry fixed effects. Under both definitions of the four-quarter structure, the Peer Ratio exhibits lower levels of significance with the Fama and French 12 than in the baseline model, and even lower levels in the Fama and French 49. The results suggest that when accounting for industry-specific factors, the effect of peer adoptions on the likelihood of adopting the four-quarter structure weakens. The use of these fixed effects-removes between-industry variation in the probability of adopting the structure. Therefore, since the Peer Ratio loses significance upon their inclusion, it might to some extent have been proxying for industry-specific tendencies to adopt the structure.

The Fama and French definitions capture whether any common industry factors, for example for "Durables" in the Fama and French 12 classification, affect the likelihood of four-quarter adoption. However, this broad industry classification hardly captures peer specific factors, which is what we attempt control for when addressing endogeneity.[77] When using the two-digit SIC classification as fixed-effect, the Peer Ratio is insignificant under both definitions. This is the industry classification which best resembles a control for common factors within the peer group, so this is as close as we can get to account for this. Essentially, we cannot rule out what Manski (1993) calls correlated effects, which are factors that are correlated with the likelihood of adoption for all firms within the peer group. It therefore seems that the Peer Ratio to some extent proxies for these unobserved factors. The only concern with this interpretation, though, is that the use of the two-digit SIC classification as a proxy for these effects is distorted by the resemblance with the Peer Ratio, just as the three-digit SIC classification. Although the relation is not one-to-one between the peer group and the two-digit SIC fixed-effect, there might still be problems of lacking variation as explained in section 5.4. To conclude on the analysis with fixed-effects, we are unable to confirm Hypothesis 3, as

[77] It is questionable whether an industry classification as "Durables" captures group-specific factors for all the different peer groups that fall into this category.

our baseline results are not robust to controls for common factors in the peer group. Nor can we completely reject it, though, due to the concerns with the use of this control for common factors.

In section 5.4, we explained that we only account for industry-fixed effects in the final robustness tests of Hypothesis 3. In Table 6.4.10 specification (2), we include Fama and French 49 fixed-effects with the unrestricted definition of the four-quarter structure. This facilitates a direct comparison with Andres and Hofbaur's (2017) previous findings on the probability of four-quarter adoption. The probit analysis in that paper utilizes similar industry controls, and this allows us to compare the effects of the explanatory variables in both models. Our model is similar to Andres and Hofbaur (2017), expect for the inclusion of the Peer Ratio and the absence of the variables that are not at our disposal. Thus, we use specification (2) of Table 6.4.10 as a direct extension of the findings by Andres and Hofbaur (2017). With this industry fixed-effect, the Peer Ratio is insignificant. Hence, when using the same analysis as previous findings on the probability of adoption, there is no impact of peer adoptions. Nonetheless, the inclusion of the Peer Ratio reveals some differences in terms of sign and significance compared to Andres and Hofbaur (2017). D. ROA and ILLIQ were both positive and insignificant in previous findings, but in our analysis, they both turn out to be negative and significant. Earnings variation is negative and significant in previous research, but the variable is insignificant in our analysis. Likewise, the Repurchases variable is positive and insignificant in our study, while it was positive and significant in previous findings. The inclusion of the Peer Ratio into the model thus changes the relative effect of other variables.

This concludes on our discussion of endogeneity-related robustness tests. Essentially, we are unable to determine that firms react to peers' decisions to follow the structure. There might be general conditions that increase the likelihood of adoption for all peer group members independently of each other. As we cannot confirm Hypothesis 3, we do not attempt to pursue further analyses to address endogeneity concerns. Basically, further analyses are either unfeasible in our research setting, or unnecessary based on our inability to rule out unobserved factors at this stage. However, in what follows we consider further steps that would ideally help identifying social effects in the analysis of four-quarter adoptions. These examples help illustrate further limitations of our research, as it discusses identification strategies that would ideally enhance our analysis.

Firstly, a standard identification strategy in studies of social effects would be to instrument the peer effect variable (Leary & Roberts, 2014; Kaustia & Rantala, 2015). In our setting, this requires an instrument that explains firm adoption only through its effect on peer adoption, meaning that the instrument should be significantly correlated with the peers' decision to adopt, but not with the firm's decision. However, our research setting makes it difficult to justify an adequate instrument. Such instruments are generally difficult to come up with, and we deemed it unfeasible to argue in favor of any of the candidates we considered. Basically, industry conditions will likely drive the explanatory variables we have, both for the firm and its peers, so it is at the outset challenging to justify an instrument.

Secondly, if we had been able to better rule out the influence of unobserved factors, we would need to address the possibility that firms react to peer characteristics and not peer behavior. Leary and Roberts (2014) demonstrate how peer effects occur through two distinct channels. Either the firm reacts solely to the peers' decision, or alternatively it reacts to changes in peer characteristics. To distinguish between these two channels of peer effects, one must include average peer characteristics in the regression. In our case, this would entail controlling for peer characteristics equivalent to those of the firm, such as MTB, Size or Earnings variation. However, to some extent we account for peer characteristics via the use of two-digit SIC codes. Thus, if our results were robust to the control for unobserved factors, this would have been the next step. In conclusion, these potential further analyses exemplify that more research is needed to examine the existence of peer effects on dividend structure policies. With better data availability or more sophisticated methods, there is room to further test the hypothesis.

To conclude on our analysis of Hypothesis 3, we cannot confirm that an increasing share of peer adoptions in the four-quarter structure increase the likelihood of adoption for the firm. In the derivation of the hypothesis, we contended that rational herd behavior would explain the decision-making process that leads firms to deduce information from their peers' decisions. Our baseline model confirmed this, while we contemplated alternative explanations for the observed behavior. As for the robustness tests, we firstly test the sensitivity of our results to methodological concerns. These mostly supported our baseline results, although we acknowledge some critiques of our baseline methodology in the discussion of our findings. Furthermore, we address the potential endogeneity concerns in our analysis, by controlling

for group-specific factors related to the probability of adopting the structure. Our results were generally not robust to these tests. Thus, while we find support for the hypothesis in many specifications, we cannot not confirm Hypothesis 3. However, more research is needed to better provide conclusions to the hypothesis. We provided indications of where this research could be heading, by explaining the potential improvements of our analysis if better peer groups can be defined or if adequate instruments can be developed.

## 6.5. Analysis of Hypothesis 4

As stated in the derivation of Hypothesis 4, following a four-quarter sequence should be reflected in increased dividend smoothing compared to not following the structure. In addition, our confirmation of Hypothesis 2.i further supports this. It shows that firms who follow the four-quarter structure make small adjustments to dividends, consistent with dividend smoothing tendencies. As explained in the section 5.5, we apply Equation 5.5.1 in which we regress the change in dividends on the coefficient dev. This coefficient measures SOA, and the higher SOA the lower is the tendency to smooth dividends. To test the hypothesis that four-quarter firms smooth dividends more than other firms, we include the Post-4QRS variable to indicate that the firm has previously followed the structure. We expect the coefficient on the Post-4QRS variable to negatively impact the dev coefficient and thereby SOA.

### 6.5.1. Measuring the Association between Four-quarter Structures and Dividend Smoothing

Our final hypothesis states that following the four-quarter structure should be associated with higher dividend smoothing, and we conduct the analysis as explained in section 5.5. [78] In model specification (1), we use the entire dividend-smoothing sample, and simply measure the impact of dev on the change in dividends. The coefficient on dev denotes SOA, and it is positive and significant at the one percent level. It estimated to be 10.9%, which implies that it takes the average firm nine years to close the gap between actual- and target dividend levels. In model specification (2), we apply the same regression using only the firms that do not yet follow the four-quarter structure in dividend increases, meaning that the Post-4QRS variable

[78] Summary stats for the dev variable and the dependent variable deltaDPS are given in Appendix Table 6.5.1.

in Equation 5.5.1 equals zero. In specification (3), we use only the firms that follow the four-quarter structure, which means that the Post-4QRS variable in Equation 5.5.1 equals one. The coefficients on dev in these two specifications show whether there is a difference in SOA depending on whether the firm has adopted the structure. Specification (2) shows that the average SOA is 13.6% for firms not following the four-quarter structure, and specification (3) shows that the coefficient is 9.2% for firms following the four-quarter structure. Hence, it takes the firms not following the four-quarter structure on average less than seven and a half years to close gap, while it takes almost eleven years to close the gap for firms that follow the four-quarter structure. The difference between specifications (2) and (3) implies that firms following the four-quarter reference structure are slower to adjust their dividends to new earnings levels, as it takes an additional three and a half years to close the gap between the actual and target dividend level. Model specification (4) fully resembles Equation 5.5.1, as all observations are included and because we include the interaction term of dev and Post-4QRS. The interaction term of dev and Post-4QRS is negative and significant at the one percent level. This shows a statistically significant slower speed of adjustment for firms following a four-quarter structure.

The results in specifications (1) to (4) support Hypothesis 4. However, as Leary and Michaely (2011) document that dividend smoothing generally has been increasing over time, the interaction term might simply be proxying for general time trends that increase smoothing. This is due to the construction of the Post-4QRS variable, which is somewhat biased towards the end of the sample period. There are more values of one for this variable in the end of the sample period, since more and more firms adopt the structure over time. To control for time trends affecting dividend smoothing, we include indicator variables for the decade in which the observation occurred. In addition, we generate interaction variables between the decade indicators and the dev variable. We do this following Andres and Hofbaur (2017), to see whether the dev variable and the interaction term between Post-4QRS and dev contain any explanatory power beyond the time trends. If they were only proxying for time trends, they should become insignificant at the inclusion of these time variables. We observe that the dev variable, the interaction term and the Post-4QRS variable are all still significant at the one percent level, and therefore that our results are unaffected by time trends. With respect to the time trends, the coefficient on the interaction terms is positive and significant from the 1970s

to the 1990s, and negative and significant for the 2000s. This indicates that time trends explain some of the movement in the speed of adjustment in dividends. In summary, the results support Hypothesis 4 that firms who follow the four-quarter structure smooth dividends more than other firms.

**Table 6.5.1**

Four-quarter Structure and Dividend Smoothing.

This table displays the results of panel regressions on the change in dividends per share ($\Delta D_{it}$). All variables are defined in Appendix Table A. Standard errors (in parentheses) are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dev | 0.1093*** | 0.1355*** | 0.0919*** | 0.1109*** | 0.1134*** |
| | (0.005) | (0.007) | (0.005) | (0.005) | (0.005) |
| Post-4QRS x dev | | | | -0.0000*** | -0.0005*** |
| | | | | (0.000) | (0.000) |
| Post-4QRS | | | | 0.0189*** | 0.0202*** |
| | | | | (0.002) | (0.002) |
| 1960s | | | | | -0.0169*** |
| | | | | | (0.003) |
| 1970s | | | | | -0.0273*** |
| | | | | | (0.003) |
| 1980s | | | | | -0.0223*** |
| | | | | | (0.003) |
| 1990s | | | | | -0.0303*** |
| | | | | | (0.003) |
| 2000s | | | | | -0.0198*** |
| | | | | | (0.003) |
| 1960s x dev | | | | | 0.0010 |
| | | | | | (0.001) |
| 1970s x dev | | | | | 0.0007*** |
| | | | | | (0.000) |
| 1980s x dev | | | | | 0.0003*** |
| | | | | | (0.000) |
| 1990s x dev | | | | | 0.0004*** |
| | | | | | (0.000) |
| 2000s x dev | | | | | -0.0035*** |
| | | | | | (0.001) |
| Constant | 0.0314*** | 0.0250*** | 0.0407*** | 0.0236*** | 0.0437*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.002) |
| N | 57,515 | 33,671 | 23,844 | 57,515 | 57,515 |
| R-squared | 0.137 | 0.155 | 0.129 | 0.142 | 0.151 |
| Sample | All | Pre-4QRS | Post-4QRS | All | All |

### 6.5.2. Discussion of Hypothesis 4

Our results are in line with Andres and Hofbaur (2017), and we thereby support their finding that there is an association between following the four-quarter structure and increased dividend smoothing. In line with Andres and Hofbaur (2017), we stress that the findings of our analysis do not imply a causal relation between following a four-quarter structure and smoothing dividends. Our analysis simply shows that following a four-quarter structure in dividends in associated with having a lower SOA, but this is not to say that firms smooth more because they chose the four-quarter structure. In the following, we discuss methodological limitations to our findings and conclude on Hypothesis 4.

From our analysis, we cannot determine that firms smooth more because they follow the structure. Nor can we confirm the reverse relation that firms chose the structure because they intend to smooth dividends more. Moreover, except for the time trends we do not control for any other factors that could affect SOA. This prevents us from making inferences in general about dividend smoothing, as our regression model suffers from omitted variable bias. For example, Leary and Michaely (2011) control for various firm characteristics when analyzing cross sectional variance in SOA, when they identify that agency costs to some extent explains the decline. We would have to conduct a similar analysis to test whether following the four-quarter structure leads firms to smooth more. Furthermore, a limitation of Equation 5.1.1 is that the Post-4QRS variable makes overly simplifying assumptions on the adoption of four-quarter structures. It practically assumes that once firms adopt the structure, they continue to follow it for the rest of the time they are in the sample. However, as previously discussed, some firms abandon the structure after having adopted it the first time. Therefore, some observations where the Post-4QRS equals one inevitably account for firms who do not follow the structure. Hence, our analysis is limited to identifying that there is an association between following the four-quarter structure and dividend smoothing.

Essentially, this analysis simply further illustrates that the four-quarter structure is evident from observing corporate data. Andres and Hofbaur (2017) suggest that this association could potentially offer explanations to the question posed by Leary and Michaely (2011) on why SOA has declined over time. If further research could determine that following a four-quarter structure leads to increased smoothing, then it seems plausible that the increased tendency over time to follow the structure could affect dividend smoothing tendencies. However, it

remains a question for future research to further explicate this relation. If anything, the results presented in this analysis suggest that the four-quarter structure should at some point be accounted for in future analyses of dividend smoothing. In conclusion, our analysis supports the finding by Andres and Hofbaur (2017) that following a four-quarter structure is associated with higher dividend smoothing.

# 7. Conclusion

This thesis analyze whether there is evidence of peer effects on firms' decision to adopt the four-quarter structure in dividend increases (four-quarter structure). As this builds on findings by Andres and Hofbaur (2017), the thesis intends to verify these findings. Previous literature shows that the informational content of dividends is declining, due to a decreasing asymmetry of information between firms and the market (Amihud & Li, 2006). Andres and Hofbaur (2017) argue that this is because dividend increases are becoming more predictable. Specifically, Andres and Hofbaur (2017) show that dividend-increasing firms increasingly tend to follow a four-quarter structure, whereby they increase dividends in the same quarter every year for several consecutive years. In rational markets, investors should incorporate this predictability into their knowledge of the firm. Consequently, dividend increases that follow this four-quarter structure should provide less new information than other dividend increases. This is what Andres and Hofbaur (2017) find, by showing how the announcement return is significantly lower for dividend increases that follow this four-quarter structure. Andres and Hofbaur (2017) further investigate what makes firms decide to follow the structure. They find that firm characteristics such as size and market value affect the probability of adoption. To this point, these findings represent the only established knowledge on why firms adopt the four-quarter structure. Our thesis attempts to extend this knowledge by seeking further explanations as to why firms decide to follow the four-quarter structure.

The inspiration for our analysis of peer effects on the decision to adopt the four-quarter structure is that several studies have revealed a significant impact of peer decisions on corporate policies (Foucault & Fresard, 2013; Leary & Roberts, 2014; Kaustia & Rantala, 2015). We develop our hypothesis based on a model of herd behavior, which posits that it can be rational to follow decisions by peers when the decision is complex (Banerjee, 1992). We

hypothesize that since the decision to adopt the four-quarter structure depends on industry prospects, firms might rationally infer from peer adoptions that it is beneficial to follow the four-quarter structure. Dividend-increasing peers face the same choice on following the four-quarter structure and have similar industry prospects. Therefore, the firm should become more likely to adopt the four-quarter structure the more peers adopt the structure. This leads to our hypothesis that the probability that the firm adopts the four-quarter structure should be increasing in the share of peers who follow the four-quarter structure.

Before testing the hypothesis on peer effects, we attempt to verify previous findings by Andres and Hofbaur (2017). Firstly, our results support the existence of a four-quarter structure in dividend increases, as firms seem to base their decision on dividend increases to the decision made four quarters ago. Secondly, our results support the finding that dividend increases that are part of the four-quarter structure are associated with significantly lower announcement returns. Moreover, these results were robust to the use of a more restricted definition of the four-quarter structure. In brief, we confirmed Hypothesis 1 and support Andres and Hofbaur's (2017) argument that dividend increases that follow the four-quarter structure lead to lower informational content.

Our tests of Hypotheses 2.i to 2.vii mostly confirm the findings by Andres and Hofbaur (2017) on what drives the probability of four-quarter adoption. Our logit analysis shows that firms who adopt the four-quarter structure are typically large, high valued, have lower dividend yields and make only small increments to the dividend level. Likewise, the past tendency by firms to follow the four-quarter structure is a highly significant predictor of continued adoption. We thereby confirm Hypotheses 2.i to 2.iv as well as 2.vii. We are unable to confirm Hypotheses 2.v and 2.vi, as there is no significant impact from earnings variation or from being a share repurchasing firm. Instead, we find that increases in earnings and illiquidity negatively affect the probability of adoption. In summary, our findings mostly identifies the same effects of firm characteristics on the probability of adoption as Andres and Hofbaur (2017). This provides support for the findings by these authors, and it furthermore serves as a foundation for our contribution to the literature.

Hypothesis 3 represents our new contribution to the literature. We hypothesize that the probability of adopting the four-quarter structure should be positively affected by the share of peers who adopt the structure. Our results show mixed support for this hypothesis. Our

baseline analysis shows that the probability that the firm adopts the four-quarter structure increases the more peers adopt the structure. Furthermore, this result was robust to the use of an alternative major explanatory variable and to the use of a linear probability model. We further test the robustness of these results to the use of an alternative definition of peer groups, and this showed mixed support for our results. Moreover, we show that the baseline results remain robust to the use of an alternative definition of the four-quarter structure. In addition, we analyze the impact of peer effects in a restricted sample, where we only include the first adoption time for those firms who at some point adopt the four-quarter structure. Using this sample, we see no evidence of peer effects. In brief, these first methodological robustness tests mostly support our baseline findings.

To this point, our analyses mostly support Hypothesis 3. However, the results are more sensitive to our robustness tests on endogeneity threats. These endogeneity robustness tests address the reflection problem of studying social effects (Manski, 1993). The challenge in studies of peer effects on corporate policies is to isolate the impact of peer behavior from common factors in the peer group. We make these analyses to account for such unobserved common factors in the peer group that could potentially affect the probability of adopting the four-quarter structure. Several results show evidence against our hypothesis when we make these analyzes. As we cannot rule out that common factors to the peer group affect the probability of adoption, our analysis does not overcome the reflection problem. As a result, we cannot confirm Hypothesis 3. Nonetheless, we do find some significant results for the hypothesis. Moreover, our study is subject to methodological limitations, so the analysis could possibly be enhanced by alternative approaches. This suggest that our results could serve as a first step towards better understanding peer effects on the decision to adopt the four-quarter structure, and we therefore encourage further research on the topic.

We further confirm Hypothesis 4, our final verification of the findings by Andres and Hofbaur (2017). This shows that there is an association between following the four-quarter structure and dividend smoothing. While this does not imply a causal relation between the two, it does suggest that firms who follow the four-quarter structure exhibit more dividend smoothing than other firms. Hence, we leave it for future research to further explore the relation between the four-quarter structure and dividend smoothing.

While our findings suggest implications for practitioners and future research, they are all subject to methodological limitations. Firstly, the confirmation of Hypothesis 1 suffers from general limitations of event studies (Brooks, 2014), in the sense that there might be cross-sectional dependence between our events. We do not account for this, nor do we conduct further robustness test to address endogeneity concerns. Secondly, in both Hypotheses 2.i to 2.vii and 3 we use a logit regression model where the dependent variable proxies for firm adoption. Although we apply different definitions of the four-quarter structure, we cannot fully avoid the problem of coincidental adoptions in our data. We thus have observations that indicate firm adoption of the four-quarter structure even though the firm ceases to follow the structure in the next quarter. Thirdly, our analysis of Hypothesis 4 includes only the most basic variables for analyzing dividend smoothing. Our finding on the association between dividend smoothing and the four-quarter structure are thus subject to omitted variable bias.

Our analysis of Hypothesis 3 on peer effects is subject to three general limitations. Firstly, we use the three-digit SIC code to define peer groups. This is our best available definition and has been used in previous literature (Leary & Roberts, 2014). However, a more detailed definition of peers would better allow us to ensure peer relatedness (Kaustia & Rantala, 2015). Secondly, in our attempt to address group-specific unobserved factors we are unable to accurately control for the peer group. This is due to the relation between our Peer Ratio and the three-digit SIC fixed-effect. Thirdly, compared to previous studies of social effects, our ability to address endogeneity threats is limited by the setting we analyze. Ideally, we would address the threat of endogeneity using an instrumental variable regression, but we do not find an adequate instrument for this purpose. In summary, our conclusions to Hypothesis 1 to 4 are made with reservations for these limitations.

To conclude, our hope is that our thesis has inspired future work on better understanding whether there is evidence of peer effects on the decision to follow the four-quarter structure in dividend increases. We find several results that support our analysis, but we have not been able to confirm our hypothesis on peer effects. Nor have we been able to reject it, and it therefore remains an open question to further investigate. Our analysis highlights the methodological limitations of our approach, and this should provide future research with suggestions to enhance the analysis. We believe this provides future researchers with a starting point in terms of further testing this hypothesis.

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# Appendices

## Appendix Table A

Definition of variables
This table contains the definitions of all variables used in the analysis. COMPUSTAT items are given in parentheses. Continuous variables are winsorized at the 1% tails.

| Variable | Definition |
|---|---|
| Panel A: Dividend Variables | |
| 4-Qtr. structure | Indicator variable that equals one if the firm has increased its dividends four quarters ago and zero otherwise. |
| # 4-Qtr. structure | Natural logarithm of one plus the number of consecutive prior dividend increases announced in the same calendar quarter as the current announcement. |
| Interim increase | Indicator variable that equals one if a) the current dividend increase happens within three quarters of the last increase and b) the last increase followed the four-quarter structure. |
| Adoption | Indicator variable that equals one if the firm increases its dividend payments four quarters later and zero otherwise. |
| D.rel.div | Rate of change in dividends in two consecutive quarterly dividend declarations. |
| DPS | Dividends per share (dvpsx) adjusted for stock splits and stock dividends (ajex). |
| Div. yield | Dividend amount (divamt) times four scaled by the price. |
| Div. | Cash dividends paid (dvc) |
| Post-4QRS | Indicator variable that takes the value of one for all periods following and incluing T and zero otherwise. T is defined as the first period where the 4-Qtr. structure equals one. |
| Total past adoptions | Accumulates all the previous times the 4-Qtr. structure has taken the value of one. |
| dev | Deviation from the target payout ratio (TPR), defined as the target payout ratio times the earnings per share (epspx) minus the dividends per share (dvpsx) paid during the prior year. The target payout ratio is the firm's median dividend-payout ratio over the sample period. The dividend payout is defined as cash dividends divided by net income. |
| Panel B: Other Variables | |
| Contemp. EA | Indicator variable set to one if the firm has announced earnings numbers (rdq) during the time interval (-2;2) around the dividend declaration date. |
| ILLIQ | The Amihud (2002) Illiquiduty measure, defined as the average of the daily ratio of absolute stock return to the dollar trading volume. We calculate it based on the trading days within the 12 months preceding the observation month. As in Amihud (2002), the measure is calculated only for stocks that have at least 200 trading days during the 12-month period. |

| | |
|---|---|
| EPS | Earnings per share (epspx) adjusted for stock splits and stock dividends (ajex). |
| Earnings | Earnings are defined as earnings before extraordinary items (ib) plus interest expense (xint) plus Investment Tax Credit (itci). |
| ROA | Return on assets, defined as earnings scaled by total assets (at) |
| Earnings variation | Standard deviation of ROA during a trailing 5-year interval. |
| D.ROA | Change in earnings defined as the last four quarterly earnings minus the preceding four quarterly earnings. The variable is scaled by total assets (at). |
| LVG | Leverage is total debt, which equals long term + short term debt (dlc + dltt) divided by total assets (at). |
| Market value of assets | Book value of assets (at) minus book value of equity plus market value of equity (csho * prcc). Book Value of Equity is defined as stockholders' equity (seq). |
| MTB | Market value of assets scaled by total assets (at). |
| Size | Natural logarithm of the market capitalization (csho*prcc) |
| Repurchases | We measure repurchases following Skinner (2008). We measure net repurchases, which is the increase in common treasury stock if the firm use the treasury stock method. If not, repurchases is measured as the difference between stock repurchases and stock issuances from the statement of cash flows. |
| | |
| Panel C: Peer Effect Variables | |
| Peer Ratio | The ratio of total four-quarter dividend increases over total increases for firms within the same peer group (three-digit SIC classification). The ratio excludes the firm itself, and it measures the ratio over the four quarter prior to time t, t-4Q to t-1Q. |
| Peer Dummy | Indicator variable taking the value of one if the Peer Ratio exceeds the market ratio. The market ratio is defined as the ratio of total four-quarter increases over total increases for all firms, in the four-quarters prior to time t (t-4Q to t-1Q). |
| 5-Year History Variable | The Peer Ratio measured over the five years prior to time t-4Q, i.e. quarters t-5Q to t-20Q. |
| 10-Year History Variable | The Peer Ratio measured over the ten years prior to time t-4Q, i.e. quarters t-5Q to t-40Q. |

## Appendix Table 4.3.1

Summary Statistics for Continuous Variables

This table contains the calculation of the different percentiles for continuous variables used in the analysis of Hypotheses 1 to 3.

| | D. rel. div. | Div. yield | MTB | Size | LVG | ROA | D. ROA | Earnings variation | ILLIQ | Repurc-hases |
|---|---|---|---|---|---|---|---|---|---|---|
| 1st percentile | 0.0213 | 0.0040 | 0.7382 | 2.4075 | 0.0025 | -0.0043 | -0.0212 | 0.0018 | 0.0000 | 0.0000 |
| 5th percentile | 0.0370 | 0.0072 | 0.8701 | 3.3978 | 0.0194 | 0.0079 | -0.0078 | 0.0030 | 0.0000 | 0.0000 |
| 25th percentile | 0.0833 | 0.0160 | 1.1472 | 5.3953 | 0.1186 | 0.0180 | 0.0005 | 0.0058 | 0.0000 | 0.0000 |
| Median | 0.1294 | 0.0254 | 1.4895 | 6.8921 | 0.2090 | 0.0247 | 0.0037 | 0.0091 | 0.0001 | 0.0000 |
| 75th percentile | 0.2000 | 0.0389 | 2.0571 | 8.3410 | 0.3007 | 0.0330 | 0.0079 | 0.0134 | 0.0012 | 0.0000 |
| 95th percentile | 0.5000 | 0.0650 | 3.4346 | 10.6178 | 0.4873 | 0.0511 | 0.0212 | 0.0265 | 0.0171 | 139.8096 |
| 99th percentile | 1.5000 | 0.0879 | 5.4476 | 12.0070 | 0.6546 | 0.0791 | 0.0461 | 0.0509 | 0.0541 | 980.8200 |

## Appendix Table 6.3.1

Correlation Matrix for variables in Hypotheses 2.i. to 2.vii.

| | Adoption | D. rel. div. | Div. yield | MTB | Size | LVG | ROA | DROA | Repur-chases | ILLIQ | Earnings variation |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Adoption | 1 | | | | | | | | | | |
| D. rel. div. | -0.127 | 1 | | | | | | | | | |
| Div. yield | -0.116 | -0.023 | 1 | | | | | | | | |
| MTB | 0.169 | 0.000 | -0.389 | 1 | | | | | | | |
| Size | 0.213 | -0.078 | -0.296 | 0.476 | 1 | | | | | | |
| LVG | 0.001 | -0.036 | 0.042 | -0.129 | 0.076 | 1 | | | | | |
| ROA | 0.001 | 0.075 | -0.023 | 0.488 | 0.044 | -0.150 | 1 | | | | |
| DROA | -0.104 | 0.148 | -0.024 | 0.081 | -0.112 | -0.064 | 0.380 | 1 | | | |
| Repurchases | 0.076 | -0.014 | -0.065 | 0.155 | 0.382 | 0.053 | 0.035 | -0.038 | 1 | | |
| ILLIQ | -0.140 | 0.101 | 0.197 | -0.243 | -0.54 | -0.037 | -0.001 | 0.100 | -0.079 | 1 | |
| Earnings variation | -0.074 | 0.202 | 0.008 | 0.135 | -0.030 | -0.059 | 0.206 | 0.165 | -0.001 | 0.038 | 1 |
| #4-Qtr. Structure | 0.392 | -0.202 | -0.088 | 0.209 | 0.300 | 0.010 | -0.017 | -0.149 | 0.117 | -0.161 | -0.148 |

## Appendix Table 6.4.1

Correlation Matrix for variables in Hypothesis 3 – The unrestricted four-quarter definition
The Hashtag variable is the stata variable name for the # 4-Qtr. structure and Adoptt4 is the Adoption variable.

| | Adoptt4 | PeerDu~y | PeerRa~o | Dreldiv | DivYield | MTB | Size | LVG | ROA | DROA | Repurc~s | ILLIQ | Earnin~n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adoptt4 | 1.0000 | | | | | | | | | | | | |
| PeerDummy | 0.0693 | 1.0000 | | | | | | | | | | | |
| PeerRatio | 0.1030 | 0.7994 | 1.0000 | | | | | | | | | | |
| Dreldiv | -0.0484 | -0.0071 | -0.0045 | 1.0000 | | | | | | | | | |
| DivYield | -0.0765 | -0.0006 | -0.0387 | 0.4821 | 1.0000 | | | | | | | | |
| MTB | 0.1613 | 0.0804 | 0.1276 | 0.0189 | -0.1434 | 1.0000 | | | | | | | |
| Size | 0.2203 | 0.0604 | 0.1592 | -0.0069 | -0.1631 | 0.4449 | 1.0000 | | | | | | |
| LVG | 0.0003 | 0.0039 | 0.0079 | 0.0362 | 0.1209 | -0.0544 | 0.0702 | 1.0000 | | | | | |
| ROA | 0.0189 | 0.0206 | 0.0251 | 0.0276 | 0.0008 | 0.4005 | 0.0657 | -0.0922 | 1.0000 | | | | |
| DROA | -0.0901 | -0.0372 | -0.0895 | 0.0279 | -0.0087 | 0.0466 | -0.1124 | -0.0446 | 0.2815 | 1.0000 | | | |
| Repurchases | 0.0501 | 0.0240 | 0.0454 | -0.0064 | -0.0215 | 0.0765 | 0.2553 | 0.0246 | 0.0156 | -0.0230 | 1.0000 | | |
| ILLIQ | -0.1217 | -0.0330 | -0.0932 | 0.0052 | 0.0874 | -0.1863 | -0.4646 | -0.0392 | -0.0180 | 0.1134 | -0.0384 | 1.0000 | |
| Earningsva~n | -0.0546 | -0.0512 | -0.0730 | 0.0800 | 0.0988 | 0.1203 | -0.0090 | -0.0067 | 0.1493 | 0.1602 | -0.0041 | 0.0243 | 1.0000 |
| Hashtag4Q | 0.3919 | 0.0921 | 0.1619 | -0.0489 | -0.0584 | 0.1954 | 0.3043 | 0.0068 | 0.0057 | -0.1251 | 0.0797 | -0.1377 | -0.1122 |

## Appendix Table 6.4.2

Correlation Matrix for variables in Hypothesis 3 – The restricted four-quarter definition
The Hashtag variable is the stata variable name for the # 4-Qtr. structure and Adoptt4 is the Adoption variable.

| | Adoptt4 | PeerRa~o | Dreldi~w | DivYie~w | MTB_w | Size_w | LVG_w | ROA_w | DROA_w | Earnin~w | ILLIQ_w | Repurc~w | Hasht~4Q | Totalp~n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adoptt4 | 1.0000 | | | | | | | | | | | | | |
| PeerRatio | 0.1383 | 1.0000 | | | | | | | | | | | | |
| Dreldiv_w | -0.1748 | -0.0852 | 1.0000 | | | | | | | | | | | |
| DivYield_w | -0.0947 | -0.1044 | -0.0229 | 1.0000 | | | | | | | | | | |
| MTB_w | 0.1897 | 0.1664 | -0.0000 | -0.3887 | 1.0000 | | | | | | | | | |
| Size_w | 0.2518 | 0.1708 | -0.0777 | -0.2960 | 0.4755 | 1.0000 | | | | | | | | |
| LVG_w | 0.0110 | 0.0072 | -0.0356 | 0.0419 | -0.1286 | 0.0761 | 1.0000 | | | | | | | |
| ROA_w | 0.0084 | 0.0107 | 0.0746 | -0.0230 | 0.4879 | 0.0443 | -0.1496 | 1.0000 | | | | | | |
| DROA_w | -0.1402 | -0.0947 | 0.1481 | -0.0239 | 0.0808 | -0.1123 | -0.0641 | 0.3800 | 1.0000 | | | | | |
| Earningsva~w | -0.1057 | -0.0982 | 0.2015 | 0.0077 | 0.1349 | -0.0298 | -0.0589 | 0.2058 | 0.1654 | 1.0000 | | | | |
| ILLIQ_w | -0.1667 | -0.1143 | 0.1006 | 0.1970 | -0.2426 | -0.5420 | -0.0367 | -0.0011 | 0.0995 | 0.0377 | 1.0000 | | | |
| Repurchase~w | 0.1015 | 0.0644 | -0.0142 | -0.0650 | 0.1551 | 0.3822 | 0.0530 | 0.0352 | -0.0376 | -0.0011 | -0.0789 | 1.0000 | | |
| Hashtag4Q | 0.5331 | 0.1660 | -0.1844 | -0.0872 | 0.2023 | 0.2858 | 0.0052 | -0.0188 | -0.1329 | -0.1407 | -0.1457 | 0.1140 | 1.0000 | |
| Totalpasta~n | 0.4460 | 0.2145 | -0.2477 | -0.1117 | 0.2838 | 0.4713 | 0.0531 | -0.0160 | -0.1640 | -0.1676 | -0.2438 | 0.1823 | 0.6810 | 1.0000 |
| Post4QRS | 0.3799 | 0.1773 | -0.2386 | -0.0781 | 0.2055 | 0.3859 | 0.0262 | -0.0170 | -0.1467 | -0.1722 | -0.2528 | 0.1154 | 0.4824 | 0.8229 |

## Appendix Table 6.4.3

Four-quarter Structure and Peer Effects – Defining Peers by Fama and French 49 Industry Classifications
The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. The dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. We further control for announcement year and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Peer Ratio | 0.6424*** | 0.6523*** | 0.6279*** | 0.6217*** | 0.6211*** | 0.4732*** |
| | (0.135) | (0.160) | (0.163) | (0.164) | (0.164) | (0.148) |
| D. rel. div. | -1.2005*** | -1.0763*** | -1.0476*** | -1.0575*** | -1.0578*** | -0.5232*** |
| | (0.127) | (0.136) | (0.140) | (0.141) | (0.141) | (0.125) |
| Div. Yield | -10.2805*** | -7.9598*** | -6.3580*** | -5.8386** | -5.8684** | -7.7406*** |
| | (1.899) | (2.383) | (2.456) | (2.522) | (2.525) | (2.074) |
| MTB | | 0.2136*** | 0.2634*** | 0.2629*** | 0.2641*** | 0.1689*** |
| | | (0.055) | (0.059) | (0.060) | (0.060) | (0.049) |
| Size | | 0.1582*** | 0.1372*** | 0.1243*** | 0.1200*** | 0.0573*** |
| | | (0.025) | (0.025) | (0.029) | (0.030) | (0.022) |
| LVG | | -0.1225 | -0.1522 | -0.1780 | -0.1796 | -0.1844 |
| | | (0.258) | (0.273) | (0.276) | (0.277) | (0.225) |
| ROA | | -1.3607 | -1.0741 | -1.4030 | -1.4648 | -0.3612 |
| | | (2.696) | (2.924) | (2.981) | (2.988) | (2.480) |
| D. ROA | | -16.1394*** | -14.9948*** | -15.4605*** | -15.4374*** | -9.0281*** |
| | | (2.566) | (2.626) | (2.702) | (2.700) | (2.650) |
| Earnings variation | | | -15.4249*** | -15.4925*** | -15.4850*** | -6.1642* |
| | | | (4.205) | (4.235) | (4.239) | (3.620) |
| ILLIQ | | | | -5.5190 | -5.9279 | -5.8566 |
| | | | | (4.152) | (4.170) | (3.621) |
| Repurchases | | | | | 0.0002 | 0.0001 |
| | | | | | (0.000) | (0.000) |
| # 4Qtr | | | | | | 2.7498*** |
| | | | | | | (0.096) |
| Constant | -0.7625 | 0.0269 | 0.3946 | 0.3979 | 0.4233 | 0.3804 |
| | (0.660) | (0.391) | (0.417) | (0.432) | (0.432) | (0.388) |
| N | 17,619 | 13,180 | 12,509 | 12,142 | 12,142 | 12,142 |
| R^2-pseudo | 0.0733 | 0.0791 | 0.0818 | 0.0811 | 0.0811 | 0.173 |
| Time series | 1962-2015 | 1973-2015 | 1973-2015 | 1974-2015 | 1974-2015 | 1974-2015 |

## Appendix Table 6.4.4

Peer Ratio Effect with the first Four-quarter Adoption only
The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. The dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. We further control for announcement year and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| PeerRatio | -0.0111 | 0.0128 | -0.0474 | -0.0337 | -0.0338 |
| | (0.136) | (0.162) | (0.174) | (0.177) | (0.177) |
| D. rel. div. | -0.0130 | -0.0198 | -0.0088 | -0.0114 | -0.0116 |
| | (0.101) | (0.095) | (0.095) | (0.088) | (0.088) |
| Div. yield | -13.9599*** | -13.8462*** | -11.9856*** | -12.0925*** | -12.0791*** |
| | (2.314) | (3.341) | (3.520) | (3.674) | (3.671) |
| MTB | | 0.0531 | 0.0553 | 0.0536 | 0.0543 |
| | | (0.091) | (0.110) | (0.115) | (0.114) |
| Size | | 0.1126*** | 0.0803** | 0.0945** | 0.0935** |
| | | (0.035) | (0.036) | (0.043) | (0.043) |
| LVG | | -0.5805* | -0.9279** | -0.9086** | -0.9079** |
| | | (0.349) | (0.388) | (0.396) | (0.396) |
| ROA | | -1.8108 | -3.8075 | -3.7035 | -3.7148 |
| | | (4.102) | (4.631) | (4.784) | (4.799) |
| D.ROA | | -8.5675** | -7.9317* | -9.1911* | -9.1919* |
| | | (4.011) | (4.563) | (4.796) | (4.795) |
| Earningsvariation | | | -1.7240 | -0.8947 | -0.9098 |
| | | | (5.222) | (5.340) | (5.324) |
| ILLIQ | | | | 3.8888 | 3.8525 |
| | | | | (3.929) | (3.924) |
| Repurchases | | | | | 0.0002 |
| | | | | | (0.002) |
| Constant | -0.9158 | -0.3915 | 0.1160 | -0.2599 | -0.2569 |
| | (0.657) | (0.557) | (0.606) | (0.678) | (0.677) |
| N | 4,858 | 2,843 | 2,476 | 2,371 | 2,371 |
| R^2-pseudo | 0.0566 | 0.0647 | 0.0677 | 0.0690 | 0.0690 |

## Appendix Table 6.4.5

Peer Ratio Effect – Thee-digit SIC Code Fixed-Effects
The table shows the result of a logit regression of the impact of firm characteristics on the propensity to follow a four-quarter structure in dividend increases. The dependent variable is set to one if the firm increases its dividend in t and announces a follow-up increase in time t+4Q. Conversely, it is set to zero if the firm increases its dividend at t but does not announce a follow-up increase at time t+4Q. We further control for announcement year and quarter. Standard errors, shown in parentheses, are clustered at the firm level. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Peer Ratio | -0.2228*** | -0.2945*** | -0.2928*** | -0.2929*** | -0.2936*** | -0.2213*** | -0.2458*** | -0.3004*** |
| | (0.072) | (0.085) | (0.087) | (0.089) | (0.089) | (0.086) | (0.090) | (0.088) |
| Dreldiv | -1.0685*** | -0.9417*** | -0.9451*** | -0.9653*** | -0.9658*** | -0.5416*** | -0.5854*** | -0.7344*** |
| | (0.117) | (0.131) | (0.136) | (0.137) | (0.137) | (0.126) | (0.135) | (0.137) |
| DivYield | -9.2503*** | -7.5450*** | -5.5734** | -5.0911** | -5.1231** | -7.1283*** | -9.2306*** | -7.1353*** |
| | (1.827) | (2.260) | (2.351) | (2.398) | (2.400) | (2.037) | (2.236) | (2.298) |
| MTB | | 0.1207** | 0.1680*** | 0.1569** | 0.1583** | 0.0925* | 0.1085* | 0.1605** |
| | | (0.060) | (0.064) | (0.065) | (0.065) | (0.056) | (0.064) | (0.064) |
| Size | | 0.2011*** | 0.1846*** | 0.1768*** | 0.1719*** | 0.1053*** | 0.0568* | 0.1244*** |
| | | (0.026) | (0.027) | (0.031) | (0.032) | (0.025) | (0.030) | (0.031) |
| LVG | | -0.2896 | -0.2626 | -0.3217 | -0.3243 | -0.3723 | -0.4766* | -0.2019 |
| | | (0.269) | (0.286) | (0.290) | (0.290) | (0.244) | (0.275) | (0.279) |
| ROA | | 2.7121 | 2.7935 | 2.7184 | 2.6405 | 3.3508 | 4.0736 | 2.7691 |
| | | (2.633) | (2.840) | (2.892) | (2.891) | (2.589) | (2.875) | (2.862) |
| D.ROA | | -14.7017*** | -14.0468*** | -14.7150*** | -14.6890*** | -9.0977*** | -13.2483*** | -13.9780*** |
| | | (2.610) | (2.732) | (2.794) | (2.793) | (2.765) | (2.789) | (2.849) |
| Earnings variation | | | -8.3398** | -7.9365* | -7.9131* | -1.2087 | -2.3346 | -4.7097 |
| | | | (4.199) | (4.239) | (4.249) | (3.754) | (4.495) | (4.244) |
| ILLIQ | | | | -5.8460 | -6.3215 | -6.1318 | -9.9422** | -2.1796 |
| | | | | (4.410) | (4.453) | (3.922) | (4.225) | (4.363) |
| Repurchases | | | | | 0.0002 | 0.0001 | -0.0000 | 0.0002 |
| | | | | | (0.000) | (0.000) | (0.000) | (0.000) |
| Hashtag4Q | | | | | | 2.4592*** | | |
| | | | | | | (0.098) | | |
| Total past adoption | | | | | | | 0.0993*** | |
| | | | | | | | (0.009) | |
| Post4QRS | | | | | | | | 0.7526*** |
| | | | | | | | | (0.082) |
| Constant | -2.4278*** | -0.7437 | -0.2453 | -0.2484 | -0.2177 | 0.1280 | 0.6237 | 0.0070 |
| | (0.831) | (0.536) | (0.654) | (0.694) | (0.698) | (0.680) | (0.696) | (0.676) |
| N | 17,507 | 13,049 | 12,382 | 12,018 | 12,018 | 12,018 | 12,018 | 12,018 |
| R^2-pseudo | 0.127 | 0.139 | 0.141 | 0.141 | 0.141 | 0.206 | 0.168 | 0.152 |

## Appendix Table 6.5.1

Summary Statistics for Continous Variables Hypothesis 4
The two continuous variables are dev (deviation from target payout) and delta DPS (the change in dividends per share). The two variables exhibit a correlation of 0.37.

| Mean | Std. Dev | Min | Max |
|---|---|---|---|
| -0.0659 | 0.4295 | -2.5006 | 1.1193 |
| 0.0242 | 0.1270 | -0.5805 | 0.6400 |