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Share Repurchases and the Effects on Investment Behaviour

An empirical analysis of recent trends in corporate payouts: the increased use of share repurchase programs and its effect on investment behaviour

Abstract

This paper examines the increased use of share repurchase programs as a corporate payout method. Following the work of Grullon and Michealy (2002) and Skinner (2008), I first confirm the substitution hypothesis that firms indeed use share buybacks instead of dividend payments to distribute cash to its shareholders. The main purpose of this study is to investigate the associated changes in real investments. Extensive payouts to equityholders have been a topic of debate as critics claim that corporate resources should rather be invested in productive assets. Using different proxies for investments, I examine repurchase activity and the associated changes in investments. The findings of this research indicate that increasing values of share repurchases are correlated to lower levels of capital expenditures, employment, and investments in R&D.

JEL classification: G31, G35

Keywords: share repurchases; dividends; payout policy; investment behaviour; capital expenditures; employment; R&D

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1. Introduction

In this paper, I study the recent trend of firms using share repurchases in order to distribute earnings to shareholders. Before share buybacks gained popularity, firms used dividends to transfer wealth to their shareholders (Lintner, 1956). Recent studies show that around 1980, share repurchase programs have increased in frequency and size (Fama and French, 2001; Grullon and Michaely, 2002). Researchers have developed a substitution hypothesis, which states that firms use share repurchases instead of dividend payments (Barclay and Smith, 1988; Grullon and Michaely, 2002; Jagannathan, Stephens, and Weisbach, 2000; Skinner, 2008). The presented evidence associated with this hypothesis has been contradicting. However, more recently written papers tend to support the substitution assumption.

My goal is not only to test the substitution hypothesis, but mainly to examine the consequences of repurchases on the investment behaviour of companies. First, I test the interrelationship between dividends and repurchases using similar methods as Grullon and Michaely (2002) and Skinner (2008). Grullon and Michaely use Lintner's (1956) analysis of dividends. Lintner's work suggests that dividend policies are a function of both a targeted payout ratio as well as the speed at which current dividends adjust to the target. I use this function to estimate predicted dividend payments. Next, I calculate the 'dividend-forecast error', which is the difference between the expected dividend payment and the actual payment made by the company. The correlation between the forecast error and the use repurchase programs shows whether or not firms substitute repurchases for dividend payments. Skinner takes a closer look at the distribution of firms according to their dividend and repurchasing behaviour over time. He also incorporates Lintner's model to test the relationship between corporate payouts and earnings on a subset of firms.

As I expect to find evidence in support of the substitution hypothesis, the main purpose of my research is to establish possible consequences of this observation. Buyback programs have been criticized for being a manipulative tool in the hands of a firm's management. Lazonick (2014) has questioned its use by claiming that firms should instead use their resources for investments in productive assets, in contrast to using them to buy back shares. His claims that real investments suffer under the repurchase programs are not backed by strong empirical evidence. A paper by Almeida, Fos, and Kronlund (2015) looked at these consequences for firms that used repurchases in order to meet the earnings per share (EPS) expectations of analysts by influencing the number of shares outstanding. They found that repurchase programs

tend to reduce investments and employment. At the same time, these companies have lower cash holdings.

This paper extends earlier work by examining the changes in corporate policies for firms that use repurchases as a wealth transfer method, which is a different motive for repurchases in comparison to the sample that Almeida, Fos, and Kronlund (2015) investigate. By regressing different proxies for investments in productive assets on repurchasing behavior, I expect to find a negative relationship between investments and buybacks. In line with the ideas of Lazonick (2014) and the work of Almeida, Fos, and Kronlund (2015), this would indicate that firms indeed use available resources to repurchase own shares instead of investing them in real assets.

The combination of an increase in repurchasing behaviour and the effect it has on real investments has important implications. The taxable differences between dividends and repurchases affect firms, investors, and (tax) authorities. Furthermore, the reduction in real investments could have a negative impact on future economic growth. According to Lazonick (2014), U.S. stock markets have revived after the Great Recession, however the large corporate spending on repurchases is the reason this prosperity is not shared with the American workers. The economic gains flow to the shareholders, while no new employment opportunities are created. Hanauer (2015) shares this view by stating that excessive payouts hurt the American middle class, but also harms firms and the entire economy. Historically, economic growth led to higher wages and investments in other productive assets, nowadays profits flow out of the real economy. Overall, this issue is part of a broader debate that firms payout too much of their earnings to shareholders at the cost of investments, which raises justifiable concerns.

The findings of this paper support the notion that firms have increased their levels of payout to shareholders over time. This trend is associated with the increased popularity of share repurchases as a method of transferring wealth to shareholders. The number of firms that pay dividends without making repurchases has declined substantially. At the same time, the number of companies that repurchase shares, either in combination with or without paying dividends, has increased steadily between 1980 and 2014. My analysis of the substitution hypothesis supports the findings of previous studies. The results show that firms use resources for buybacks that could otherwise have been used to increase dividends. In other words, companies buyback their own stock to replace dividend payments.

The main objective of this study is to examine the associated effects on investment behaviour. I test the correlation between the level of repurchases and the changes in real

investments using three proxies for investments; capital expenditures, employment, and R&D. The regression results for each of the three investment variables show that repurchases are indeed related to lower levels of investments. These results become even stronger as the length of the evaluation period increases. As expected, the proxy for investment opportunities (Tobin's q) is positively correlated to the level of investments.

These findings have some important implications for firms, investors, and (tax) authorities, due to taxable differences between dividends and capital gains. But perhaps the decreasing levels of investments might raise even bigger concerns. It does not only question the trend of increased payouts to equityholders, but also the use of repurchases itself. As was noted by Lazonick (2014), lower investments in productive assets could have serious consequences on future economic growth. He claims that the stock markets should be used to finance companies, and not the other way around.

My research extends previous work on the substitution hypothesis (Grullon and Michaely, 2002; Skinner, 2008). Furthermore, I link recent trends in corporate payouts to their effects on investment behaviour. This paper is organized as follows. Section 2 reviews previous literature on dividends, repurchases, and investments. Section 3 describes the predictions and hypotheses of this study. Section 4 explains the data selection procedures and aggregate trends. Section 5 presents the methodological steps of my research. The results are reported in section 6. Section 7 provides some concluding remarks.

2. Literature review

The first part of my research examines corporate payout policy, companies distributing earnings to its shareholders. I am especially interested in the transfer of income to the companies' shareholders via dividends and share buybacks. Previous papers have described trends of alternative methods being used to reward shareholders, share buybacks are one of the alternatives (Bagwell and Shoven, 1989; Grullon and Michaely, 2002). The use of substitute methods has important implications for firms, investors, and (tax) authorities. The second part of this study examines the investment behavior of firms that indeed use repurchases as a substitute for the payment of dividends. In the remainder of this section, I review previous literature on the topics of dividends and share repurchases. Starting with the fundamental irrelevance theory dating back to 1961, and also covering recent findings. I also review existing work on investments at the end of this section.

2.1 Dividends

In 1956, Lintner (1956) examined the distribution of incomes by corporations. His research showed that returns are used for either dividends, retained earnings or to pay taxes. He found that the fraction of earnings used to pay dividends remains rather constant, so retained income is a byproduct of dividend paying behavior. Lintner argues that the dividend payout ratio is determined by several different factors, for example management's growth prospects for the industry and the company itself. Since these factors vary greatly across companies, dividend payout ratios vary as well. From these observations, an important question has been derived over fifty years ago; how does a company's payout ratio affect its share price? Furthermore, is there an optimal payout ratio that maximizes firm value? Miller and Modigliani (1961) examined the relationship between dividends and company valuation in their work, developing one of the fundamental theories in corporate finance.

2.1.1 Dividend irrelevance theory

Miller and Modigliani (1961) use a set of assumptions in order to create a framework to test the effects of dividends. They assume the existence of 'perfect capital markets', 'rational behavior', and 'perfect certainty'. The last assumption indicates that future investment policy and profits are known for every corporation. From this framework, the authors conclude that given a firm's investments, the payout policy does not affect the current share price of a company. This conclusion also indicates that under the same assumptions, the use of dividend

payments or share repurchases as a payout measure does not alter the share price either. The comparison of dividends and repurchases is discussed later in this section.

The fundamental framework described above offered new insights for further academic research. Researchers became interested in investigating payout policy and firm value under weaker market conditions. Miller and Scholes (1978) do so by adding personal taxes, showing that despite taxable differences between capital gains and dividends, investors are indifferent between the two under sufficient conditions. Investors should be able to replicate any dividend paying behavior by making changes in their own portfolio and personal borrowings. Miller and Modigliani (1961) predicted that firms with different payout ratios would attract investors with different preferences, aligned with the company. However, these so called 'clientele effects' do not seem to exist.

Previous research has questioned both the decision of firms to payout dividends, as well as the response of investors to dividends. Easterbrook (1984) developed a theory in order to explain why companyies pay dividends. It seems contradictive for firms to pay dividends and raise new funds in capital markets at the same time. First of all, firms incur costs by raising new equity in order to maintain their optimal investment level. Secondly, dividends are taxable for investors, while companies can reduce taxes by holding and reinvesting their earnings. On the other hand, there are arguments in favor of dividends. For example, some firms might need to divest or liquidate, and in that case resources could be more useful in the hands of investors than the firm. According to Easterbrook (1984), dividends are used to discipline management by taking excess cash out of the company. This agency cost theory is also supported by Jensen (1986).

2.1.2 Investor response to dividends

So far, researchers discussed the relevance of dividends only in theory under a set of assumptions. It is interesting to examine the reaction of investors to dividend changes using empirical data. There was an important observation made by a 1980 research, which concluded that share prices move too much in accordance with subsequent changes in dividends (Shiller, 1983). In other words, share price changes cannot be rationally explained by underlying changes in dividends. Richardson, Sefcik, and Thompson (1986) took a different approach in examining investor behaviour, they investigated first-time changes in dividend policy and the trading volume around the announcement. They found that there are significant increases in trading volume of a firm's stock surrounding the announcement. Their evidence suggests that a change in dividend policy contains an informational signal regarding future earnings

expectations. In contrast to the irrelevance theory, investors actually seem to react on dividend payout changes.

From an investor perspective, the response to dividend announcements also leads to controversy. Empirical evidence shows that investors react positively to dividends, a phenomenon that is known as the dividend puzzle (Black, 1976). Recall from the irrelevance theory that investors should not care about whether or not firms pay dividends. Black argues that this behaviour is linked to the signaling of information through dividend payouts. Shefrin and Statman (1984) developed a theory that explains this preference through investor self-control reasons. According to their research, some investors are willing to pay a premium in exchange for 'self-control, segregation, and regret reduction'. So the positive response is attributed to the behavioural and psychological characteristics of investors. Explaining investors' reactions to corporate payouts is beyond the scope of this paper. However, the observed response itself and its implications for share prices are relevant.

2.1.3 Decrease in dividend payouts

In 1978, 66.5% of all NSYE, AMEX, and NASDAQ firms paid dividends to its shareholders (Fama and French, 2001). This percentage dropped to just 20.8% of the firms in 1999. This large decrease over time was studied by a research of Fama and French, examining firm characteristics and possible reasons. First, new listings have increased the share of companies with low profits and high growth opportunities. These characteristics match those of firms who tend to be less likely to pay dividends. Furthermore, even given this change in company demographics, firms overall became less likely to pay dividends. A possible reason for this decline is that firms use different methods to transfer wealth to their shareholders, share buybacks for example.

Figure 1 presents the development of aggregate earnings and dividends between 1980 and 2014. In contrast to the decline in the number of dividend paying companies according to Fama and French (2001), the total value of dividends paid increased steadily. The aggregate amount of dividends in 2014 has grown more than 8-fold with respect to its value in 1980. The aggregate earnings increased at roughly the same rate. This indicates that the accumulated dividend payout ratio has remained roughly constant over this period, approximately 40 percent of earnings.

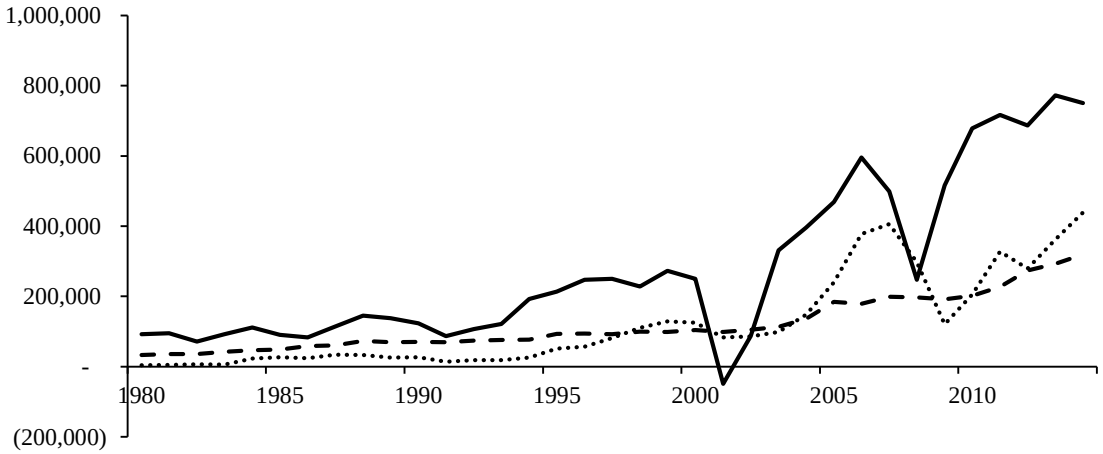

Figure 1. The aggregate earnings (solid line), dividends (dashed line), and net repurchases (dotted line) for all public U.S. firms for the period 1980–2014.[1]

2.2 Repurchases

Besides dividends, there are alternative methods to distribute cash to shareholders, for example cash-financed acquisitions or share repurchases (Bagwell and Shoven, 1989). The latter method has become an increasingly popular corporate practice to achieve a variety of purposes. A company usually buys back a specified number of its own common shares through the open market, private negotiation, or via a tender offer (Dann, 1981).

The increase in repurchasing activity between 1980 and 2014 is shown in Figure 1. The total value of the net repurchases by U.S. firms increased from approximately $25 billion in 1985 to over $400 billion in 2014. In 1998, the total value of buybacks exceeded the total amount of dividends for the first time in history, and it continued to do so in most years thereafter. The figure clearly shows that the level of repurchases moves in accordance with the level of earnings, in contrast to the steadily growing level of dividends. Before 1980, repurchasing activity was not significant in size and frequency, and therefore my research is based on firm data starting from this year forward.

Grullon and Michealy (2004) give two major reasons for the increase in open-market repurchases that have been covered in previous literature. The first reason is that the managers of a company use repurchases to signal better prospects. This motivation has been discussed by Bhattacharya (1979) and Miller and Rock (1985). A second reason is that buybacks can be

[1] The annual data used is retrieved from the WRDS Compustat database and excludes financials and utilities. Earnings, dividends and net repurchases are measured following Skinner (2008). Net repurchases are calculated as the change in treasury stock. In case the firm does not report changes repurchases in treasury stock, I measure them as the difference between stock repurchase and stock issuances. Similar to the approach of Skinner, if either of the two measures is negative, the value of stock repurchases is set to zero.

used to reduce the amount of free cash flow available to management (Jensen, 1986). By doing so, it reduces the risk of management potentially over-investing. This is more likely to be relevant for firms with limited investment opportunities. This reasoning is developed from an agency theory perspective.

2.2.1 Causes of stock price changes

Share repurchases alter the financial structure of a company. This has implications for the shareholders and the holders of other classes of securities. Evidence shows that the announcement of a repurchase via a tender offer is associated with a significant increase in the firm's share price (Masulis, 1980). Dann (1981) names three possible explanations for this price effect. First of all, there are tax savings associated with the distribution of cash to shareholders compared to dividends. The second explanation is related to the signaling motive for managers to repurchase stock, which has been mentioned earlier. This repurchasing decision reveals managerial information on the future prospects of the firm, affecting the market's opinion on the value of the company. A third explanation is related to the wealth transfer from the firm's bondholders to its stockholders. Vermaelen (1981) adds a fourth explanation related to the change in a company's leverage. Buybacks can be financed by issuing debt, which increases the interest payment and the associated tax benefit. The benefit is passed on to the shareholders.

Although the above mentioned repurchase hypotheses are not mutually exclusive, Vermaelen (1981) poses evidence in support of the signaling hypothesis. Firms are willing to repurchase shares at a premium if they have positive information on their future prospects. Positive managerial inside information causes management to believe that the stock market is currently undervaluing their firm, and paying a premium is therefore justified. Although there exist different reasons for repurchasing own shares, management often communicates that the market is undervaluing the stock. The next step is to analyze how investors react to an announcement of a buyback.

Ikenberry, Lakonishok, and Vermaelen (1995) examine both short and long run market responses to a repurchase announcement. They find that the average response to the news release of a buyback is a 3.5 percent increase in stock price over a short time period. This reaction seems relatively small in comparison to the claims of management that the stock is undervalued. This indicates that either managers are overly optimistic or the market is not valuing the company correctly. Using a longer time horizon, Ikenberry, Lakonishok, and Vermaelen show that the market initially underreacts to the repurchase announcement.

Combining the announcement and long-run returns gives a company undervaluation of approximately 15 percent. This finding is in line with the mispricing argument made by management.

2.2.2 Criticism

The practice of share repurchases has been subject to criticism from outsiders. Some say that stock buybacks are a tool for managers to manipulate their own stock price. Often a company announces its intention to repurchase stocks on the open market, but this does not mean the firm is committed to do so. This creates flexibility for management, there is an option to repurchase shares (Ikenberry and Vermaelen, 1996). Management is concerned with creating long-term value for its shareholders. This means they will only use the option to buy back shares in case the stock is undervalued. They can use their insider information regarding the future prospects of the company to time a repurchase. According to Ikenberry and Vermaelen this option view on repurchases harms short-term investors at the cost of long-term investors.

Another research claims that repurchase programs can be used as an earnings management tool (Hribar, Jenkins, and Johnson, 2006). The idea is that repurchasing shares increases a firm's EPS. Therefore, managers can use repurchases and time them in order to beat the EPS forecasts of analysts. Hribar, Jenkins, and Johnson show that companies that would otherwise miss their EPS expectations, use repurchases abnormally more frequent. Their evidence suggests that beating or meeting analyst forecasts affects the buyback decision of managers. Additionally, their research shows that this practice is successful in avoiding some of the negative stock price response that would have occurred in case the forecasts are missed.

2.3 Substitution hypothesis

Now that I have discussed the existing literature on dividends and repurchase programs, I review multiple papers that provide evidence both opposing and supporting the hypothesis that firms more gradually use repurchases as a substitute for dividends. Similar to dividend payments, repurchases involve a cash flow from the firm to its shareholders (Masulis, 1980). As explained below, more recent research provides evidence in support of the substitution hypothesis.

Both dividends and repurchases have been attributed a signaling purpose regarding the future prospects of the company. In order for a signal to be credible, an associated cost should be induced. For dividends this cost is the payment of the dividends itself, this is not only the cash outflow, but also the opportunity cost of potential forgone investments. For repurchases,

the signaling costs are the transaction costs related to raising new capital (Miller and Rock, 1985). John and Williams (1985) note that due to differences in taxability between the two payout methods, they are not fully interchangeable. Their model suggests that the higher taxes on dividends are costs of the signal as well. According to Allen, Bernardo, and Welch (2000) the tax difference leads to 'clientele effects'. Dividend paying companies attract more institutional investors, since this investor type is relatively less taxed than individual investors. The evidence shows that in practice, dividends and repurchases are not 'perfect' substitutes, which is in contrast to what the dividend irrelevance theory suggests.

DeAngelo, DeAngelo, and Skinner (2004) observed a decline in the payment of special dividends between 1950 and 1995.[2] However, they did not find significant evidence to believe that this decline can be attributed to an increased usage of repurchases. Open market repurchases have become a popular instrument for U.S. industrials between 1985 and 1996, as the number of program announcement grew from 115 to 755, and the announced value increased from $15.4 billion to $113 billion (Jagannathan, Stephens, and Weisbach, 2000). Jagannathan, Stephens, and Weisbach showed that repurchases did not replace dividend payouts, they take a complementary role. The payments of dividends remain rather constant over time, while volatile repurchases are paid in case of sustainable cash flows. These findings are in agreement with those of Brav, Graham, Harvey, and Michaely (2005). By surveying financial executives, their study indicates that companies maintain their historical dividend level, while residual cash flows are used to buy back shares.

Perhaps Grullon and Michaely (2002) were the first ones to document evidence in support the substitution hypothesis. Not only have repurchases become an important payout method, according to them firms finance buyback programs with funds that would otherwise be used to increase dividends. First, Grullon and Michaely noted that as the average dividend payout ratio declined between 1972 and 2000, the average repurchase ratio increased, keeping the total payout ratio rather constant. Furthermore, their data shows that the share of firms distributing cash for the first time by using only repurchases have increased even more rapidly, indicating that buybacks have become the most favored form of payout. Grullon and Michaely test the substitution hypothesis using a model developed by Lintner (1956) stating that the dividend policy of a firm is a function of the target payout ratio and the speed of adjustment of current dividends. In other words, this implies that the actual dividend payment depends on a long-run

[2] Special dividends are 'special' payouts, not likely to be repeated as regular (DeAngelo et al., 2000)

target payout ratio and a sustainable earnings level. This model enables them to forecast the expected dividend payment of a firm using its passed dividend behaviour, indicating any deviations from the target level. The substitution hypothesis predicts a negative correlation between the dividend forecast error (actual dividend payment – expected payment) and share repurchasing activity. This relationship would imply that share repurchases are financed with potential increases in dividends. Grullon and Michaely indeed find a negative coefficient, supporting the substitution hypothesis.

Skinner (2008) concludes that repurchases have now become the dominant form of payout. He uses different techniques to test the substitution hypothesis. The dataset containing U.S. industrial firms is used to sort firms into groupings based on dividend paying and share repurchasing history. His next step was to analyze trends in those groupings over the period 1980-2005. There are clear trends towards three dominant groups; firms that pay dividends and regularly make repurchases, firms that regularly make repurchases, and firms that occasionally make repurchases and do not pay dividends. Next to this, Skinner uses a similar method as Grullon and Michaely (2002) in order to further test the hypothesis. He also uses Lintner's (1956) model to predict that buybacks respond stronger to earnings than dividends. The coefficients show that due to an increase in usage of repurchase programs over time, total payouts (combined value of dividends and repurchases) move more closely with a firm's earnings than dividends alone.

Although previous literature offers both evidence in favor as well as opposed to the substitution hypothesis, there is enough reason to believe that firms indeed use repurchases to replace dividend payouts to its shareholders. More recent research shows clear trends in this direction, indicating that repurchase programs have become a popular payout method. Therefore, it is important to examine the implications of this tendency.

2.4 Real effects of repurchases

The increase in popularity of share repurchases has important implications for firms, investors, and authorities. In this section, I address potential consequences of an increase in its usage, focusing on the effects on corporate investments of companies. Tax effects and other consequences for investors and market authorities are beyond the scope of my research.

2.4.1. Investments

Some critics note that the resources spend on repurchase programs, should instead be used to increase the firm's productive assets (Lazonick, 2014). According to Lazonick, the increased

use of repurchases has a negative effect on the investments in productive capabilities, including employees. In his analysis, Lazonick compares the cumulative changes in productivity and cumulative changes in real wages over time in the U.S. He believes that companies have prioritized meeting the markets expectations, and do so by managing their stock prices through buybacks. Lazonick claims that this behaviour undermines production, as the available resources are not spent on innovation and employment. Furthermore, he states that corporations are now funding the stock markets, rather than vice versa. Although Lazonick does not present strong empirical evidence, he poses serious concerns regarding investments in productive assets. He believes repurchases are a form of 'value extraction' rather than value creation.

Grullon and Michaely (2004) investigate whether stock repurchases reveal information regarding a firm's future earnings growth, or whether it relates to the agency theory of free cash flows and over-investment. The latter seems the case, as their research shows that when managers are more likely to over-invest, firms increase their payout to shareholders. This is especially the case for firms with limited investment opportunities. The evidence of Grullon and Michaely suggests that these firms would have lowered their investments independently from the repurchasing decision. These findings contradict the claims concerning investments in productive assets and economic development. In this context, companies would have experienced lower investments regardless of the amount of payouts.

A recent study by Almeida, Fos, and Kronlund (2015) examined the effects on investment policy of repurchases for firms that buyback stock as an earnings management device. They used EPS motives of repurchases to exclude the effect of differences in investment opportunities. Their evidence shows that buying back shares in order to meet forecasts has significant effects on a firm's investments and financial situation. Repurchases are associated with lower levels of employment and lower investments in capital. These companies also tend to have lower cash holdings. Apparently, managers are facing a tradeoff between investing resources and meeting analyst expectations.

Almeida, Fos, and Kronlund examined the effects on EPS-motivated repurchases, but as discussed earlier, managers tend to have other motivations for buybacks as well. In this paper, I examine the effects on real investments for firms that use repurchases as a method to transfer wealth to shareholders. The firms in my sample have a payout motive for buying back stocks. First, I determine whether or not the firms in this sample indeed use repurchases as a form of payout. Next, I test the effects on investment policy for these companies. Investments are measured using three different components; capital expenditures, research & development

(R&D), and employment. In order to capture this relationship, I control for a firm's level of investment opportunities.

2.4.2 Investment opportunities

It is critical to assess the effect of the level of investment opportunities on a firm's investment policy. As noted above, limited growth opportunities might induce managers to increase their payout to shareholders and lower investments. This would suggest that it is not the increase in payout that causes investments to decline. In economic research, growth or investment opportunities refer to the availability of positive net present value projects. So it reflects the presence of valuable investment opportunities for a company. A common empirical measure of these opportunities is Tobin's q. The use of this proxy is covered in more detail in the methodological part of this paper.

The relationship between a firm's investment policy and the quality of its investment opportunities has been pointed out in other papers. Chung, Wright, and Charoenwong (1998) studied the market reaction to capital expenditure announcements of firms with respect to their investment opportunities. The evidence suggests that markets react positively to an announcement of an increase in capital expenditures in the presence of valuable opportunities. In case a firm with limited opportunities decides to lower its capital expenditures, the market reacts positive as well. So the market's assessment of the quality of investment opportunities plays a crucial role in determining whether or not changes in investment policy are considered to be a good thing. Combined with the view that low investment opportunities might be the cause of lower investments, this contradicts the claims made by critics I discussed earlier. While some argue that lower investments in productive assets harm the economy, the market actually favors a decrease in capital expenditures under certain circumstances.

3. Hypothesis Development

The main goal of my research is to examine the investment behavior of companies that make use of repurchase programs. Before I analyze the relationship between buybacks and investments, I address recent trends in corporate payouts. The data that has been presented in other papers shows a significant tendency of firms using share repurchases. Brav, Graham, Harvey, and Michaely (2005) have reported that managers are not very likely to reduce dividend payments, although this might be desirable. Given the increase of share repurchasing activity, there is reason to believe that total payouts relative to a firms earnings increases over time. I refer to total payout as the combined value of repurchase programs and dividend payments. This expectation relates to the claims made by critics of repurchases, that more recently firm's payout a larger share of their earnings. The first hypothesis addresses the change in magnitude of total payouts.

H1. The share of total payout relative to a firm's earnings has increased over the period 1980-2014.

Not only is the total payout ratio relevant for my research, but also the change in use of repurchases. Since cutting dividends is not very common, one would also expect that firms increasingly use repurchases in combination with dividends. New companies might decide to abstain from paying dividends at all, and chose to payout via repurchases only. This gives rise to two groups of companies; the first one consist of firms that pay dividends and repurchase stock, the second comprises of companies that make use of repurchases only. I expect the fraction of firms that belong to either of these two groups to increase over time. Accordingly, the fraction of firms that only pay dividends without making use of buybacks is expected to decrease over time. This leads to the following two hypotheses:

H2a. The fraction of firms that pay dividends only (without repurchasing shares) relative to the total number of firms, decreases over the period 1980-2014.

H2b. The fraction of firms that pay dividends and make share repurchases, and the fraction of firms that make share repurchases only (without paying dividends) relative to the total number of firms, increases over the period 1980-2014.

Having covered the general payout trends, I now test the substitution hypothesis that has been presented in previous literature (Barclay and Smith, 1988; Grullon and Michaely, 2002; Jagannathan, Stephens, and Weisbach, 2000; Skinner, 2008). This hypothesis predicts that

share repurchases are used as a substitute for dividend payments in order to transfer wealth to shareholders. Share repurchase programs have increased in frequency and size over time, and this observation forms the basis of the substitution assumption. I already discussed the results from earlier research, and showed that more recent papers found evidence supporting this hypothesis. Since I follow a similar methodology as Grullon and Michaely (2002), I expect to find comparable results. Their regression outcomes suggest that the two payout methods are indeed substitutable. In order for this hypothesis to hold, the evidence should prove that firms use resources to buy back shares that otherwise could have been used to increase dividends. This leads to the following hypothesis:

H3. Firms use share repurchases as a substitute for dividends as a payout method to transfer wealth to its equityholders.

Lintner's (1965) model takes a central role in my approach to test the hypothesis. To recall from the literature review, this model predicts current dividends as a function of current earnings and the historical dividend levels. Evidence in support of the substitution assumption should prove that the predictability of Lintner's model decreases over time. Replacing dividends by the level of total payout, should result in a stronger relationship with a company's earnings. In other words, the relationship between earnings and dividends diminishes as repurchase activity is higher. This concept is explained in more detail in the methodological section of this paper.

After examining the trends in corporate payouts and the substitution hypothesis, I turn to the focal issue of this study. Building on the criticism of Lazonick (2014) and Hanauer (2015), the main hypothesis is related to the investment decisions of repurchasing firms. Critics claim that nowadays firms increasingly use resources on share buybacks and other forms of payouts, while reducing their investments in productive assets. The development of total payout has been covered by the first hypothesis. The fourth hypothesis is concerned with the potential associated changes in real investments. This leads to my final hypothesis:

H4. For firms that use share repurchases as a method of corporate payout, repurchases are associated with a reduction in real investments.

In order to test this assumption, I build on the findings of the previous hypotheses. After having tested the substitution hypothesis, I regress different proxies for real investments on the use of repurchase programs. I examine the investment behaviour of a sample of firms for which the substitution hypothesis holds. These investment proxies include R&D spending, capital

expenditures and employment. I test the relationship between repurchase activity and the change in the level of the different investment proxies in the periods prior and after. A similar test was performed by Almeida, Fos, and Kronlund (2015) for firms using repurchases as tool to manipulate their EPS. Their evidence suggests that repurchases are associated with a reduction in capital expenditures and lower levels of employment. In line with this paper and the comments of critics, I expect a significant negative relation between real investments and repurchasing activity.

4. Data

4.1 Sample selection

The company dataset is created using the WRDS Compustat database to extract U.S. firm fundamental data. The significance of repurchases has emerged starting in 1980, and therefore my analysis covers firm data for the period 1980 to 2014. I exclude utility firms and financials from the sample based on their Standard Industrial Classification (SIC) codes.[3] The first part of my research requires firm financial information on earnings, market value, dividends and repurchases. Firm-year observations that have missing values for each of these items are dropped. The computation of the different variables is explained in the remainder of this chapter. The final sample consist of 16,883 firms, and a total of 162,153 firm-year observations.

4.2 Definitions

First, I examine recent trends in corporate payouts. For this, I analyze changes in firm characteristics over the 1980-2014 period using both a descriptive statistics output as well as a graphical representation. This analysis requires firm-year information on earnings, market value, dividends and repurchases. The first three items are directly obtained from the Compustat database. Earnings (EARN) are defined as total earnings before extraordinary items (Compustat item IB). The market value (MV) represents the market value of common stock (Compustat item MKVALT). Dividends (DIV) is defined as the total amount of dividends declared on all equity capital (Compustat item DVT). This measure excludes payouts in form of stock dividends. Finally, I use a similar approach as Fama and French (2001) and Skinner (2008) to measure a firm's net repurchases (REPO) during the fiscal year. First, I measure repurchases as the increase in common treasury stock (Compustat item TSTKC). Not all firms report stock repurchases using this treasury stock method, and in these cases repurchases are measured as the difference between the purchases of stock (Compustat item PRSTKC) and the sale of stock (Compustat item SSTK). If either of the two measures (treasury stock or the purchase/sale of stock) is negative, the amount of repurchases is set to zero. The final sample consists of firm-year observations that have values for each of the above mentioned items. Table A1 of the appendix reports the summary statistics and abbreviations of the variables used in this study. Table A2 presents the correlation between the different variables. It shows that the level of dividends is highly correlated with the size of the firm and its earnings. Repurchases

[3] All firms with SIC codes in the range of 4900-4999 and 6000-6900 are excluded.

are also associated with earnings, and to a lesser degree with total assets and market value of a company.

In order to test the first two hypotheses, I analyze the aggregate data on earnings, dividends and repurchases through a graphical representation of payout ratios over the relevant time period. I also examine the distribution of firms in the sample according to their payout behaviour. Companies are sorted into different groups based on the number of years in which dividends have been paid and years in which shares are bought back. The actual distribution and its implications are discussed later in this section of the paper.

4.3 Trends in aggregate payouts and payout ratios

Figure 1 has shown that repurchases by U.S. firms have grown in size significantly over the period 1980-2014. During that time interval, the aggregate values of dividends and earnings changed as well. I continue the analysis of different trends in this part of the paper. First, I further discuss the aggregate value of payouts over time and the associated changes in payout ratios. The remainder of this section shows how the distribution of firms in the total sample changed based on their dividend paying and repurchasing behaviour.

In addition to figure 1, table A3 of the appendix reports the total aggregate earnings, dividends, and repurchases over time. Furthermore, the table presents dividends and repurchases as a fraction of both earnings and market value. It is clear that the size of repurchases relative to earnings have increased significantly over the relevant time period. While the aggregate value of repurchases amounted up to just 4 percent of earnings in 1980, it exceeded 40 percent in most recent years. In contrast, the fraction of dividends has remained rather constant, with an average of 41 percent over the 35 years in the sample. Recall from figure 1 that repurchases track changes in earnings more closely than dividends, which is in line with the idea that managers use the flexibility of repurchases to absorb large variances in earnings. The last column of table A3 displays the size of repurchases relative to size of dividends. In numerous years, the value of buybacks actually exceeded the total expenditures on dividends. This was observed for the first time in 1998, however as of 2004 it continued to do so, with 2009 as the only exception.

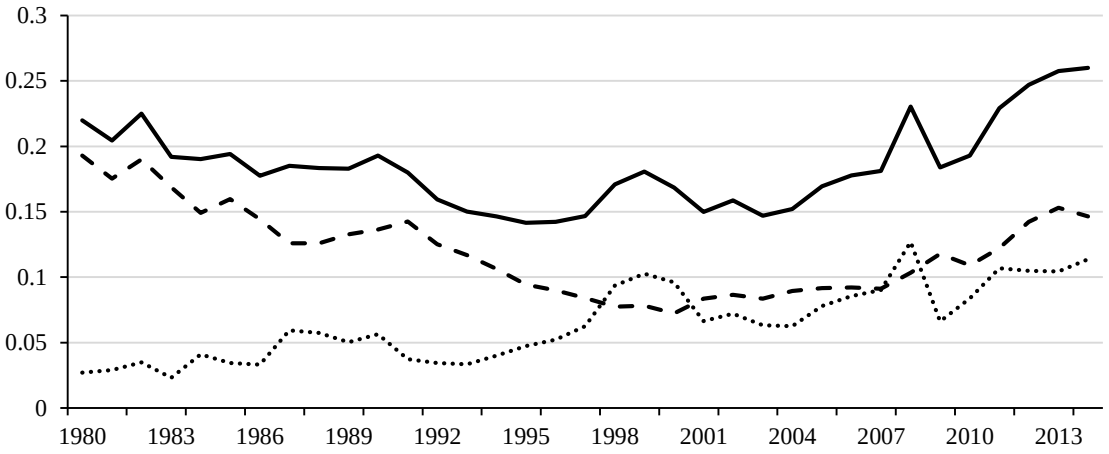

Figure 2. The average total payout ratio (solid line), average dividend payout ratio (dashed line), and net repurchases payout ratio (dotted line) for all public U.S. firms for the period 1980–2014. The analyzed sample only includes companies with positive earnings. All observations with a total payout ratio greater than one are excluded in order to reduce the effect of outliers.

Figure 2 presents the trends in average payout ratios relative to earnings for all public U.S. firms over time. The figure shows the dividend payout ratio, the share repurchase ratio and the total payout ratio, which captures the combined value of dividends and repurchases. The average total payout ratio has been decreasing between 1980 and 1995. After a period of decline, the average total payout ratio started to increase in 1996, and reached a level of 26 percent in 2014. This percentage exceeds the payout rate of 22 percent in 1980. This period of inclining total payout rates is attributable to an increase in both the average dividends payout ratio as well as the repurchase payout ratio. Over the complete research horizon of this paper, the average dividend payouts decreased by approximately 5 percent, while the average repurchase payout rate increased by more than 8.5 percent.

The first hypothesis states that the total payout rate has increased between 1980 and 2014. There is no clear increasing trend over the complete timespan. However, since the lowest level in 1995, the rate has been increasing steadily during recent years. Similar to the analysis of the aggregate levels, figure 2 shows a significant increase in the level of repurchases. It also shows that the fluctuations in repurchase payout rates can by quite large between consecutive years, which is less the case with dividends. There are two sharp decreases in repurchase rates, the first in 2001 and the second in 2008. The abrupt declines coincide with two periods of recessions in the U.S.[4]

[4] The National Bureau of Economic Research (NBER) defines the periods March–November 2001 and December 2007-June 2009 as recession periods.

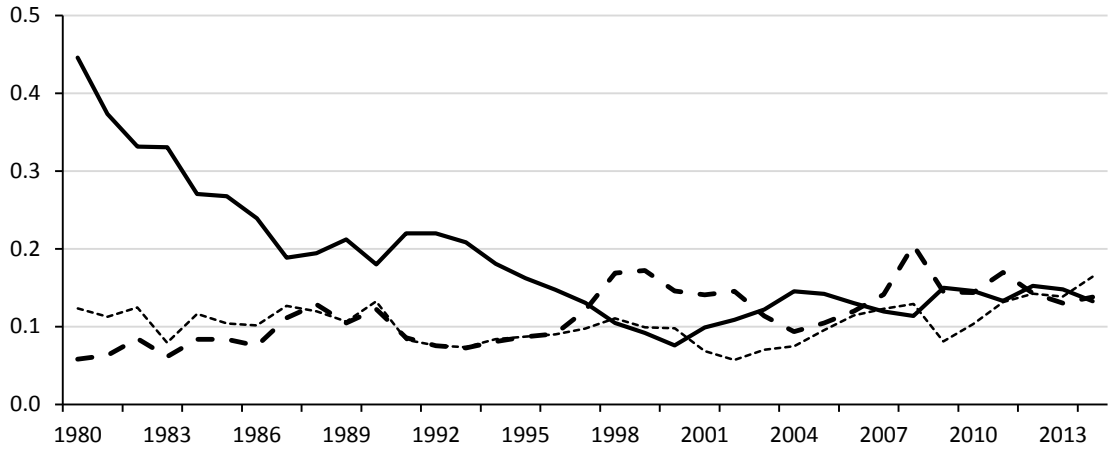

Figure 3. The fraction of all public U.S. firms that pays out dividends only (solid line), repurchases shares only (dashed line), and does both (dotted line) for the period 1980-2014.

Figure 3 shows the distribution of firms based on their payout behaviour. It presents the fraction of firms that payout dividends only, firms that make share repurchases only, and firms that do both. The fraction of firms that only pay dividends has decreased significantly. In 1980, this group comprised of 45 percent of all public U.S. firms. This fraction has dropped to just 13 percent in 2014. At the same time, the fraction of repurchasing firms has more than doubled, from just 6 percent to over 14 percent in 2014. In some years this fraction came even close to 20 percent. The proportion of firms that do both has increased slightly over time. This group experienced a downward trend between 1980 and 2002, but it has been increasing ever since and even surpassed historical values. These observations provide strong support for hypothesis 2a, and moderate support for hypothesis 2b.

From this figure it becomes clear that the fraction of firms paying out through dividends only has decreased by 30 percent. Although some firms moved to the other two groups, this decrease cannot be fully offset by their increase in fraction. A possible explanation is that firms stopped paying dividends, however this is not very likely. As Brav, Graham, Harvey, and Michaely (2005) pointed out, some managers would rather not payout dividends but omitting to do so is very unlikely. A second, and more likely explanation is that newly found firms decide to not pay dividends at all. In this case, firms are not committed to pay dividends in the future.

In comparison with the aggregate increase in value of repurchases over the relevant time period, the increase in the fraction of firms making repurchases is modest. This could be due to the fact that repurchases are not as reoccurring in nature as dividends. Firms might decide to make repurchases in one year, and withhold from doing so in the next year. This is in line with

the idea that managers make use of buybacks because of its flexibility, only buying back shares in years of good performance.

Table A4 of the appendix presents a similar distribution of firms according to their dividend and repurchasing behaviour. Companies are classified based on the number of years they have paid dividends and the number of years in which repurchases are made. The table shows the distribution of firms over three different time periods; 1980-1991, 1992-2003, and 2004-2014. Panel A displays the actual number of firms that are assigned to the different groups, as well as its relative size with respect to the total number of firms. Panel B presents the cumulative dollar value of payouts for each group (in millions).

The analysis in table A4 reveals that the share of dividend paying firms has dropped when comparing the values of the 1980-1991 period with those of 1992-2003. This group consists of all dividend paying firms, and also includes firms that make repurchases in combination with dividend payments. In the first period, 38 percent of the firms in the sample have paid dividends at least once over a time span of 12 years. In the next period, this figure has dropped to 25 percent. So the share of dividend paying companies has fallen by 13 percent, while at the same time the fraction of nonpayers has only increased by 7 percent. Since the increase in nonpayers comes short with respect to the decrease in dividend payers, this indicates that firms switched from dividend paying to making repurchases. This observation supports the hypothesis of firms switching from dividends to buybacks. However, this trend does not continue in the most recent period, 2004-2014.

An important observation with respect to the aim of this paper is that very few firms now pay dividends without making any repurchases. In 1980-1991 this group accounted for 12.5 percent of all firms in the sample, and this declined to 7.2 percent in 2004-2014. The economic significance of this group is even smaller. This trend indicates that pure dividend paying firms might be disappearing. A conclusion that could also been drawn from the analysis in figure 3.

Overall, the analysis of the distribution of firms according to their payout policy has presented evidence in support of the substitution assumption. There is an indication that firms switch from dividend payments to making repurchases. This trend appears to be stronger when comparing the first two periods. Another important observation is that the group of pure dividend paying companies is declining. I test the substitution hypothesis empirically in the next section.

5. Methodology

Now that I have established the sample and examined the trends, I continue my research by testing the substitution hypothesis. The total sample consists of firm data for the period 1980-2014, so there is a maximum of thirty-five unique year observations for each firm. The analysis of the substitution hypothesis is performed on a subset of firms meeting two requirements. First, the company has paid dividends regularly, defined as at least in nineteen years between 1980 and 2014. Second, the company has made share repurchases at least once during that period. Table A5 of the appendix presents the distribution of the total sample according to their payout policy into different groupings. There are 16,883 firms in the total sample, of which 803 meet the above stated specifications. So the fraction of relevant firms in the subset is approximately 5 percent of the total number of companies.

I test the substitution hypothesis following the work of Grullon and Michaely (2002), and I present additional evidence based on the analysis of Skinner (2008). Both studies use Lintner's (1956) model of dividend policy. According to this framework, a company's dividend policy is a function of a target payout ratio and the speed of adjustment of current dividends. In other words, the expected current dividend payment is based on current earnings and historical dividends. The traditional Lintner model is defined as

$$\Delta DIV_{i,t} = \alpha_i + c_i(DIV^*_{i,t} - DIV_{i,t-1}) + u_{i,t} \quad (1)$$

where $\Delta DIV_{i,t}$ is the actual change in dividends in year *t*, $DIV^*_{i,t}$ is the actual amount of profits multiplied by the target payout ratio in year *t*, and $DIV_{i,t-1}$ is the dividend level in year *t*-1. Lintner expects the constant to be positive because firms are more likely to raise dividends and rather reluctant to reduce dividends. This model shows that firms smooth their dividend payments, earnings are not immediately redistributed based on a target payout ratio, but the payments are also determined by those made in the previous period.

5.1 Dividend-forecast error

In order to test the substitution hypothesis, I use the concept of dividend-forecast error (ERROR) as defined by Grullon and Michaely (2002). The error captures the difference between the actual change in dividends and the forecasted change. I use the relation in equation (1) to measure the expected level of dividends and use this value to calculate its deviation from the actual dividend payment. The difference between the two represents the forecast error. The first step is to measure the Lintner coefficients for each firm in the relevant sample. The relation

in equation (1) is adapted in the regression equation (2). The Lintner coefficients are estimated using a simple OLS regression over a specific preforecast period. Based on table A5, I use panel data from 803 firms over 35 years, from 1980 to 2014. The firms in this sample have paid dividends regularly and made repurchases at least once. Furthermore, to be included, each firm in the sample must have information available for the entire preforecast period. This analysis is performed using the following regression equation

$$\Delta DIV_{i,t} = \beta_0 + \beta_1 EARN_{i,t} + \beta_2 DIV_{i,t-1} + u_{i,t} \quad (2)$$

where ΔDIV_t is the actual change in dividends in year *t*, $EARN_t$ is the actual amount of earnings in year *t*, and DIV_{t-1} is dividend level in year *t*-1. The tests are performed using two preforecast periods; 1980-1991 and 1980-2003. For every period I obtain two parameter estimates for each individual firm in the sample. The earnings coefficient is expected to be positive, as an increase in earnings is associated with an increase in dividends, resulting in a positive dividend change. The lagged dividend coefficient is expected to be negative, in case historical dividends are high, dividend change is expected to be small or negative. Similar to equation (1), the constant is expected to be positive.

The next step is to calculate the difference between the forecasted and the actual level of dividends. Grullon and Michaely define the dividend-forecast error as follows

$$ERROR_{i,t} = \left[\Delta DIV_{i,t} - \left(\hat{\beta}_{0,i} + \hat{\beta}_{1,i} EARN_{i,t} + \hat{\beta}_{2,i} DIV_{i,t-1}\right)\right] / MV_{i,t-1} \quad (3)$$

where $\hat{\beta}_{0,i}$, $\hat{\beta}_{1,i}$, and $\hat{\beta}_{2,i}$ are the parameters of the Lintner model for each firm *i* as previously estimated. Again, $\Delta DIV_{i,t}$ represents the actual change in dividends for firm *i* in year *t*. Finally, the forecast error is scaled by the lagged market value of equity in year *t*-1.

Thus the ERROR variable is the difference between the actual change and forecasted change in dividends. This implies that a positive forecast error results from firms paying more dividends than the previous year, and at the same time more than predicted based on the forecast model. On the contrary, the value of the error decreases or becomes more negative when firms lower their dividend payments in comparison to previous years and relative to the estimated amount. In order to examine the substitution hypothesis, I test the relationship between the dividend forecast-error and the use of share repurchases. I measure the repurchase expenditures at time *t* relative to the market value of equity at time *t*-1 (RYIELD). The relationship is tested using a cross-sectional regression with the ERROR term as dependent variable and RYIELD as explanatory variable. Other variables are added to the regression that

control for market value, return on assets (ROA) and level of debt. I add year-indicator variables to control for variances over time. As denoted earlier, the sample of firms comprises of companies that have paid out dividends regularly and repurchased shared at least once over the period 1980-2014. The relationships are estimated using a cross-sectional time-series OLS regression. Since the firm data is pooled, the standard errors have been clustered at firm level. The regression model looks as follows.

$$ERROR_{i,t} = \beta_0 + \beta_1 RYIELD_{i,t} + \beta_2 log(MV)_{i,t} + \beta_3 ROA_{i,t} + \beta_4 NOPER_{i,t} + \beta_5 DEBT_{i,t} + YearDUM + \varepsilon_{i,t} \quad (4)$$

If firms indeed use repurchases as substitutes for dividends, I should find a negative relationship between ERROR and repurchase activity. As noted by Grullon and Michaely, this observation would indicate that firms finance buybacks with a potential increment in dividends. In other words, as firms increase repurchases, the actual dividend payment is lower than the expected payment. A non-negative coefficient for the repurchase factor indicates that firms use buyback as a complement to the payment of dividends. The regression outcomes of these tests are discussed in the results section of this paper.

5.2 Responsiveness to earnings

In case the substitution assumption holds, managers use repurchases to replace (incremental) dividend payments. Repurchases would offer greater flexibility to absorb the volatility of earnings. This observation would also have implications for the dividend function presented in equation (2). In this equation, the earnings coefficient measures the responsiveness of dividends to a firm's profits. If repurchases replace dividend payments, then the responsiveness of total payout, the combined value of dividends and repurchases, is expected to be more responsive to earnings. This is what Skinner (2008) examined by comparing two different Lintner models. The first model is presented in equation (2), with dividend change as dependent variable. The second model uses change in total payout rather than dividends. Similar to Skinner, I define the total payout Lintner model as

$$\Delta PAY_{i,t} = \beta_0 + \beta_1 EARN_{i,t} + \beta_2 PAY_{i,t-1} + u_{i,t} \quad (5)$$

where ΔPAY_t and PAY_{t-1} denote the actual change in total payout in year *t*, and the level of total payout in the year *t*-1. I regress both models (2) and (5) using a cross-sectional time-series OLS regression. The data set includes all firms that have paid dividends regularly and repurchased shares at least once. The firm data is pooled, and therefore the standard errors are clustered at firm level.

A comparison of the coefficients and their statistical significance between models (2) and (5) should provide additional evidence regarding the substitution hypothesis. For it to hold, I expect that the payout model to better capture the relationship between payout and earnings. If repurchases provide managers with greater flexibility, the predictive power of the second model is expected to be greater, since total payouts, which include repurchases, can be used to absorb variances in earnings. Repurchases therefore better track earnings compared to dividends. This would also suggest that the lagged coefficient of payouts is expected to be less significant in the second model, since repurchase activity is less likely to be driven by historical repurchases.

5.3 Investments

The final part of my analysis examines the investment behaviour of firms that repurchase shares. I test the relationship between different proxies for investments and repurchase activity in order to see if firms change their investment policy in case it engages in share buyback programs. As before, RYIELD is the measure for repurchases. This time I also use a dummy variable to capture repurchasing behaviour, which takes a value of one in case a firm's net repurchases are positive. This variable is used in a separate analysis. Investment behaviour is captured through three different proxies. The first proxy (CAPEX) reflects capital expenditures, and comprises of the total funds used for additions in property, plants and equipment (Compustat item CAPX). The value of CAPEX is scaled by total assets. The second variable (EMP) measures a company's total number of employees (Compustat item EMP) divided by total assets as well. The final investment variable (R&D) is defined as the total R&D expense (Compustat item XRD), which comprises of all costs incurred during a fiscal year for the development of new products and services. The R&D variable is also scaled by total assets.

The goal is to find the effect of repurchases on corporate investment policy. In order to do this, I compare the levels of investments after a repurchase with prior levels. Therefore, I do not simply take the absolute values of the above mentioned variables, but instead create a dependent variable that measures the difference. My analysis is based on three different time periods for evaluating changes in investments. The first variable is computed using the one year difference by simply subtracting level of investments at t+1 by the level at t-1. The second variable reflects the difference over a three year period. This is done by calculating the average level of investments over the three years prior and the three years after a specific the firm-year observation. The third variable is computed in similar fashion, but using a five year period. All levels of investments at time t have been scaled to the level of total assets at time t.

I perform the above stated analysis on the same subsample of firms that is also used to test the substitution hypothesis. This sample includes all firms that have paid dividends regularly and made repurchases at least once. I expect to confirm the substitution assumption, meaning the firms in this sample replace repurchases for dividends. This implies that my sample consists of firms that buyback stock with the motive of transferring wealth to shareholders, and these repurchases are not motivated by a lack of investment opportunities. This method does not fully eliminate firms for which low investment opportunities are the cause of lower investments. Therefore, I further control for the potential effect of investment opportunities by adding the growth opportunity proxy Tobin's q to the regression.[5] At last, I add several other variables to the analysis, including market value, level of cash, level of debt, and ROA. I estimate the following regression model

$$\bar{Y}_{i,(t+1,t+n)} - \bar{Y}_{i,(t-1,t-n)} = \beta_0 + \beta_1 RYIELD_{i,t} + \beta_2 log(MV)_{i,t} + \beta_3 ROA_{i,t} + \beta_4 CASH_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 Q_{i,t} + IndustryDUM + YearDUM + \varepsilon_{i,t} \quad (6)$$

where Y represents the three investment proxies, and n refers to the length of the evaluation period in years. The relationship between RYIELD and different investment proxies is tested using a pooled cross-sectional time series OLS regression. The standard errors are clustered at firm level. The level of investments differs significantly across different industries, therefore I add industry dummies to the regression to control for this variation.[6] I also include year-indicator variables in this panel regression, which capture the influence of aggregate trends in my sample over time. A negative coefficient for the repurchase variable indicates that that associated investments are indeed lower. In other words, the more resources a company spends on buying back stocks, the less resources are available for investments in assets, R&D, and employees. Based on the criticism that has been made, I expect to confirm this negative relationship. I discuss the findings for the presented regression analyses in the following section of the paper.

[5] Tobin's q is measured similar to the method used by Nohel and Tarhan (1998), as the ratio of market value of assets to the book value of assets. The market value of assets is measured as; book value of assets – book value of equity + market value of equity.

[6] The industry effects are controlled for using SIC codes. I categorize the following nine major industries: agriculture, mining, construction, manufacturing, transportation & communication, wholesale trade, retail trade, services, and public administration. Observations for companies operating in the finance and utility industries have already been dropped.

6. Results

Chapter 6 reports the empirical results that relate to the different hypotheses and are the outcome of the previously explained methods. Section 6.1 covers the substitution hypothesis. The main subject of this paper is analyzed in section 6.2, this part explains the relationship between repurchasing behaviour and real investments.

6.1 Substitution hypothesis

6.1.1 Analysis of dividend-forecast error

I use the Lintner (1956) model to forecast dividend payments based on current earnings and historical dividend behaviour. The forecasts are estimated using two separate periods, 1980-1991 and 1980-2003. As explained in the methodological section, the dividend-forecasts are used to measure the forecast error, which captures the difference between the actual dividend payment and its forecast. Using a cross-sectional regression, I examine the relationship between the dividend-forecast error and the use of repurchases, measured as the repurchase yield.

Table 1 reports the regression results of the error regression. First, the regression coefficient for the repurchase variable is negative in both preforecast periods. For the first preforecast period this coefficient is significant at a 1 percent level, for the second period it is significant at a 10 percent level. A negative relationship between the dividend forecast error and repurchases supports the substitution hypothesis. As noted by Grullon and Michaely (2002), a negative relation indicates that firms finance share repurchases with resources that otherwise could have been used to potentially increase dividends. Thus, the regression outcomes support the third hypothesis.

To control for the effects of other firm specific characteristics, several other variables are included in the regression. There are control variables for the size of the firm, return on assets, nonoperating income, and the level of debt. The results show that there is a statistically significant positive correlation between the market value of the company and the error coefficient. Furthermore, the coefficients for debt are negative and statistically significant for both preforecasting periods.

As expected, these regression results suggest that firms indeed make repurchases as a replacement for a payment of dividends. The relevant coefficient is only statistically significant at a 1 percent level when using 1980-1991 as a forecasting period for the Lintner model parameters. The Lintner coefficients are used to forecast dividends using current earnings and

Table 1. Cross-sectional time-series regression of the dividend-forecast error

This table reports the coefficient estimates of the cross-sectional time-series OLS regression of the dividend-forecast error (ERROR) on repurchases (RYIELD). ERROR is calculated as described in section 5.1, and is defined as the difference between the actual and forecasted change in dividends. The observation is dropped when the absolute value of ERROR is greater than five percent. The control variables are log(MV), ROA, NOPER, and DEBT. Year indicator variables are added to the regression to control for variances over time. The regression model is defined as follows:

$$ERROR_{i,t} = \beta_0 + \beta_1 RYIELD_{i,t} + \beta_2\, log(MV)_{i,t} + \beta_3 ROA_{i,t} + \beta_4 NOPER_{i,t} + \beta_5 DEBT_{i,t} + YearDUM + \varepsilon_{i,t}$$

The variables RYIELD, NOPER, and DEBT are winsorized at a 99th percentile. The variable ROA is winsorized at a 1st and 99th percentile. Since the firm data is pooled, standard errors are clustered at firm level. The table reports the coefficient estimates and p-values (parentheses). The estimates [a],[b],and [c] are significant at a 1%, 5%, and 10% level respectively.

Dependent variable:	ERROR	
	Preforecast Period	
	1980 - 1991	1980 - 2003
Intercept	-0.0004	**-0.0029[b]**
	(0.465)	(0.012)
RYIELD	**-0.0113[a]**	**-0.0061[c]**
	(0.001)	(0.065)
log(MV)	**0.0003[a]**	**0.0001[c]**
	(0.001)	(0.072)
ROA	-0.0037	-0.0027
	(0.104)	(0.214)
NOPER	**-0.0173[c]**	-0.0160
	(0.053)	(0.101)
DEBT	**-0.0037[a]**	**-0.0022[b]**
	(0.001)	(0.014)
Year-indicator variables	yes	yes
Observations	15,264	17,366

the level of dividends in the previous year. A possible reason for the fact that the regression results are more significant in the first period, could be that the Lintner model better captures a firms dividend policy in these years. The use of repurchases has already been quite substantial around the year 2000. Predicting dividends as a function of earnings and a targeted payout ratio, could be done more precise using a period in which repurchases play no significant role. Perhaps the 1980-1991 period forms a better setting to capture the Lintner relationship, increasing the accuracy of the error coefficient. Ultimately, the effect of repurchases on the error coefficient is better estimated when using a more reliable measure of the dividend-forecast error.

6.2.2 Analysis of responsiveness

In addition to the previous test, I study the substitution hypothesis following the work of Skinner (2008). This analysis builds on the Lintner framework used in the previous section as well. Again, the sample consists of the 803 firms that regularly pay dividends, and made repurchases at least once. A pooled cross-sectional regression is used to estimate the Lintner parameters over three different time periods; 1980-1991, 1992-2003, and 2004-2014. Since the data is pooled, the standard errors have been clustered at a firm level. The regression results are reported in table 2. The earnings coefficients are positive in all three periods for both models, while the historical dividend coefficient is negative. The latter is referred to as the speed of adjustment coefficient.

Skinner (2008) showed that the strength of the traditional dividend model weakens over time. His analysis covered two periods; 1980-1994 and 1995-2005. The estimates in table 2 present a similar pattern. Both the economical and statistical significance of the earnings coefficient decreases over time, and the same holds for the speed of adjustment coefficient. The t-statistics are presented in the table as well, 3.07 and -2.27 in the first period. The declining t-statistics (1.74 and -0.01 in the 2004-2014 period) show that the statistical significance of the traditional model weakens. The earnings and lagged dividend coefficients are significant at a 1 percent and a 5 percent level for the years 1980-1991. In the third period, the earnings coefficient is significant at a 10 percent level, while the speed of adjustment coefficient is statistically insignificant.

The results for the total payout model have different implications. In this form, the earnings coefficient and the lagged payout coefficient are statistically significant at a 1 percent level in all three periods. The only exception is the earnings coefficient in the last period, which is only significant at a 10 percent level. The size of the coefficients declines during the three different periods. However, the coefficients remain larger compared to the dividend model. The table reports an earnings coefficient in the first period of 0.14 for the dividend model, taking a value of 0.28 in the total payout version. A comparison of the lagged coefficients gives a similar observation, -0.26 in the dividend model and -0.45 in the payout model.

Table 2. Lintner-model regressions

This table reports the coefficient estimates of the cross-sectional time-series OLS regression of the Lintner model. As explained in section 5.2, the two different regression models are:

$$\Delta DIV_{i,t} = \beta_0 + \beta_1 EARN_{i,t} + \beta_2 DIV_{i,t-1} + u_{i,t}$$
$$\Delta PAY_{i,t} = \beta_0 + \beta_1 EARN_{i,t} + \beta_2 PAY_{i,t-1} + u_{i,t}$$

The first one is the traditional model, the second one is the total payout model. The sample includes all 803 firms that have paid dividends regularly and made repurchases at least once between 1980 and 2014. The firm data is pooled, and the standard errors are clustered at firm level. The table reports the coefficient estimates and *t*-statistics (parentheses). The estimates [a],[b],and [c] are significant at a 1%, 5%, and 10% level.

	1980 - 1991	1992 - 2003	2004-2014
Dependent var. = $\Delta DIV_{i,t}$			
Intercept	1.15	1.27	**8.43**[a]
	(1.03)	(0.45)	(4.37)
$EARN_{i,t}$	**0.14**[a]	**0.09**[a]	**0.02**[c]
	(3.07)	(2.94)	(1.74)
$DIV_{i,t-1}$	**-0.26**[b]	**-0.17**[c]	0.00
	(-2.27)	(-1.79)	(-0.01)
Adj. R^2	0.204	0.153	0.065
Observations	8,134	8,860	6,256
Dependent var. = $\Delta PAY_{i,t}$			
Intercept	3.70	11.87	**72.46**[a]
	(1.21)	(2.22)	(3.47)
$EARN_{i,t}$	**0.28**[a]	**0.27**[a]	**0.19**[c]
	(6.39)	(5.07)	(1.88)
$PAY_{i,t-1}$	**-0.45**[a]	**-0.39**[a]	**-0.29**[a]
	(-5.97)	(-3.85)	(-2.93)
Adj. R^2	0.286	0.224	0.172
Observations	8,046	8,815	6,221

The results of this analysis are consistent with the idea of firms using both repurchases and dividends as a payout model. In accordance with Skinner (2008), total payouts track earnings more closely given the higher strength of the second model. This evidence supports the notion of managers using the flexibility of repurchases to absorb changes in earnings. Skinner states that if managers indeed use this flexibility to payout increases in earnings more rapidly, the lagged payout coefficient should be higher for the total payout model compared to the dividend model. This is confirmed by the estimations presented in table 2. All in all, the results from table 1 and 2 provide evidence in support of the substitution hypothesis.

6.2 Investment behaviour

The previous analysis confirms the predictions that firms use share repurchases as a substitute for the payment of dividends. The same sample of firms (regularly pay dividends, and repurchased shares at least once) is used to test the relationship between repurchases and a firm's investment policy. As explained earlier, I use an OLS regression to test the relationship between different proxies of investments and variables capturing repurchasing behaviour. Several control variables are added to the regression, including a proxy for investment opportunities, Tobin's q (Q). Furthermore, year and industry dummies are added to the model. I cover each of the three investment proxies in the remainder of the results section.

6.3.1 Capital expenditure

The first proxy for the investments in productive assets is a company's level of capital expenditures. To measure the difference between the level of investments prior and after repurchases, three different periods are used (one year, three years, and five years). The regression results are presented in table 3. Similar to most other firm characteristics, capital expenditures have been scaled by total assets.

The coefficients for RYIELD are negative and statistically significant for all three evaluation periods of CAPEX. The size of the coefficient increases as the length of the evaluation period increases. The negative relationship between repurchases and CAPEX suggests that share buybacks are indeed associated with lower investments. The coefficient is larger for the five-year period (-0.381) than the one-year period (-0.105), this suggests that the decline in investments is persistent over time, and not just the case in the short-run.

In addition to RYIELD, the analysis is also performed using a dummy variable for repurchases. The coefficients for the dummy variable are smaller in size in comparison to RYIELD, however they do present the same tendency of increasing in size over the length of the evaluation period. Again, all three coefficients are statistically significant at a one percent level. The regression results also show a positive correlation between return on assets (ROA) and capital expenditures. This relationship is statistically significant at a one percent level. Furthermore, there is evidence of a negative relationship between the level of cash and CAPEX. This also holds for the level of debt. The coefficients for the growth opportunities proxy Q are statistically significant for all periods as well.

Table 3. Regression of CAPEX on share repurchases

This table reports the coefficient estimates of the cross-sectional time-series OLS regression of the change in CAPEX on repurchases (RYIELD). Next to RYIELD, the regression is also performed using a dummy variable for repurchases (REPODUM), which takes the value of one in case repurchases have been made. The change in CAPEX is calculated as described in section 5.3, and is defined as the difference between the average level of CAPEX in the years after and prior to each firm-observation. Three different evaluation periods are used to capture the difference in investment level: 1 year, 3 years, and 5 years. The control variables are log(MV), ROA, CASH, and DEBT. I use Tobin's q (Q) as a proxy for investment opportunities to control for variances in these opportunities. Furthermore, I control for investment variances across industries by using industry-indicator variables. Year-indicator variables are added to the regression to control for variances over time. The regression model is defined as follows:

$$\overline{CAPEX}_{i,(t+1,t+n)} - \overline{CAPEX}_{i,(t-1,t-n)} = \beta_0 + \beta_1 RYIELD_{i,t} + \beta_2\, log(MV)_{i,t} + \beta_3 ROA_{i,t} + \beta_4 CASH_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 Q_{i,t} + IndustryDUM + YearDUM + \varepsilon_{i,t}$$

The variables RYIELD, CASH, DEBT, and Q are winsorized at a 99th percentile. The variable ROA is winsorized at a 1st and 99th percentile. The sample includes all 803 firms that have paid dividends regularly and made repurchases at least once between 1980 and 2014. The firm data is pooled, and the standard errors are clustered at firm level. The table reports the coefficient estimates and *p*-values (parentheses). The estimates [a],[b],and [c] are significant at a 1%, 5%, and 10% level.

Dependent variable:	Δ Capex (1yr)		Δ Capex (3yrs)		Δ Capex (5yrs)	
	(1)		(2)		(3)	
RYIELD	**-0.105**[a]		**-0.230**[a]		**-0.381**[a]	
	(0.000)		(0.000)		(0.000)	
REPODUM		**-0.007**[a]		**-0.015**[a]		**-0.023**[a]
		(0.000)		(0.000)		(0.000)
log(MV)	**-0.001**[a]	**-0.001**[a]	**-0.002**[a]	**-0.002**[a]	**-0.003**[b]	**-0.002**[c]
	(0.001)	(0.010)	(0.000)	(0.003)	(0.032)	(0.085)
ROA	**0.105**[a]	**0.106**[a]	**0.201**[a]	**0.204**[a]	**0.321**[a]	**0.325**[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CASH	-0.002	-0.002	**-0.026**[b]	**-0.027**[a]	**-0.057**[a]	**-0.059**[a]
	(0.709)	(0.639)	(0.013)	(0.010)	(0.007)	(0.005)
DEBT	**-0.013**[a]	**-0.015**[a]	**-0.016**[b]	**-0.020**[a]	**-0.024**[c]	**-0.031**[b]
	(0.000)	(0.000)	(0.030)	(0.005)	(0.071)	(0.020)
Q	**0.005**[a]	**0.005**[a]	**0.010**[a]	**0.010**[a]	**0.012**[a]	**0.012**[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.002)
Year-indicator variables	yes	yes	yes	yes	yes	yes
Industry-indicator variables	yes	yes	yes	yes	yes	yes
R-squared	0.084	0.085	0.163	0.165	0.181	0.182
Observations	21,609	21,609	17,960	17,960	14,556	14,556

6.3.2 Employment

The second proxy of investments in productive assets reflects changes in employment. The independent variable is the number of employees divided by total assets of a firm. Similar to the previous investment proxy, I expect a negative relationship between employment and the use of share repurchases. The regression model has the same composition as the one for capital expenditures, including the same control variables, year effects and industry effects. The regression results are presented in table 4.

The coefficients for the employment analysis indeed have similar implications as the CAPEX results. The table shows that the coefficients for both RYIELD and the dummy variable are negative and statistically significant. This implies that repurchases are associated with lower levels of employees for a certain level of assets. Again, the size of the coefficients increases over the length of the evaluation period, which was also the case in the CAPEX model. These results underline the negative correlation between the use of repurchases and the level of investments in productive assets, this time measured as the level of employment.

The coefficients for the control variables are slightly different compared to the previous analysis on capital expenditures. The regression estimates for ROA are still positive and statistically significant. However, the coefficients for the level of debt are no longer significant. The growth opportunities variable remains significant. Furthermore, table 4 shows that the market value of a company is a relevant factor for changes in the level of employees scaled by assets, but the coefficients are very small in size. So the economic significance of this variable seems rather poor.

One last important observation is that the R-squared of the employment model is significantly smaller compared to the levels in the CAPEX regression. While the R-squared in the first model varies between 8 and 18 percent, the same levels lay between just 1.5 and 3 percent. So although the repurchase coefficients seem to support our predictions, the explanatory power of the employment model is questionable.

6.3.3 Research & Development (R&D)

The third and final investment proxy comprises of the R&D spending of a firm. This variable is estimated using a firm's R&D expenses which have been scaled by total assets. Again, I use three periods to evaluate changes in R&D investments. The regression estimates are shown in table 5.

Table 4. Regression of employment on share repurchases

This table reports the coefficient estimates of the cross-sectional time-series OLS regression of the change in employment on repurchases (RYIELD). Next to RYIELD, the regression is also performed using a dummy variable for repurchases (REPODUM), which takes the value of one in case repurchases have been made. Employment (EMP) is measured as the number of employees scaled by total assets. The change in EMP is calculated as described in section 5.3, and is defined as the difference between the average level of EMP in the years after and prior to each firm-observation. Three different evaluation periods are used to capture the difference in investment level: 1 year, 3 years, and 5 years. The control variables are log(MV), ROA, CASH, and DEBT. I use Tobin's q (Q) as a proxy for investment opportunities to control for variances in these opportunities. Furthermore, I control for investment variances across industries by using industry-indicator variables. Year-indicator variables are added to the regression to control for variances over time. The regression model is defined as follows:

$$\overline{EMP}_{i,(t+1,t+n)} - \overline{EMP}_{i,(t-1,t-n)} = \beta_0 + \beta_1 RYIELD_{i,t} + \beta_2\, log(MV)_{i,t} + \beta_3 ROA_{i,t} + \beta_4 CASH_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 Q_{i,t} + IndustryDUM + YearDUM + \varepsilon_{i,t}$$

The variables RYIELD, CASH, DEBT, and Q are winsorized at a 99th percentile. The variable ROA is winsorized at a 1st and 99th percentile. The sample includes all 803 firms that have paid dividends regularly and made repurchases at least once between 1980 and 2014. The firm data is pooled, and the standard errors are clustered at firm level. The table reports the coefficient estimates and *p*-values (parentheses). The estimates [a],[b],and [c] are significant at a 1%, 5%, and 10% level.

Dependent variable:	Δ Emp (1yr)		Δ Emp (3yrs)		Δ Emp (5yrs)	
	(1)		(2)		(3)	
RYIELD	**-0.013**[a]		**-0.039**[a]		**-0.062**[a]	
	(0.004)		(0.002)		(0.001)	
REPODUM		**-0.001**[b]		**-0.002**[b]		**-0.004**[a]
		(0.014)		(0.034)		(0.000)
log(MV)	**-0.000**[a]	**-0.000**[a]	**-0.001**[b]	**-0.001**[b]	**-0.001**[a]	**-0.001**[b]
	(0.004)	(0.005)	(0.014)	(0.013)	(0.008)	(0.016)
ROA	**0.011**[b]	**0.011**[b]	**0.029**[c]	**0.029**[c]	**0.045**[c]	**0.046**[b]
	(0.024)	(0.020)	(0.065)	(0.051)	(0.056)	(0.046)
CASH	0.005	0.005	0.012	0.012	0.015	0.015
	(0.201)	(0.204)	(0.193)	(0.197)	(0.272)	(0.277)
DEBT	0.000	-0.000	-0.002	-0.003	0.001	-0.000
	(0.929)	(0.903)	(0.681)	(0.590)	(0.827)	(0.956)
Q	**0.001**[b]	**0.001**[b]	**0.002**[b]	**0.002**[a]	**0.003**[b]	**0.003**[b]
	(0.021)	(0.020)	(0.012)	(0.009)	(0.019)	(0.017)
Year-indicator variables	yes	yes	yes	yes	yes	yes
Industry-indicator variables	yes	yes	yes	yes	yes	yes
R-squared	0.015	0.015	0.025	0.025	0.033	0.033
Observations	21,471	21,471	17,751	17,751	14,303	14,303

The coefficient estimates for the repurchase variables are negative and statistically significant at a one percent level for each of the three periods. These results are consistent with the observations for capital expenditures and employment. Again, there is evidence of a negative correlation between repurchases and investments in R&D. In accordance to the pervious analyses, I find that the size of the coefficients increases with the length of the evaluation period. This observation has been persistent over each of the three investment proxies.

The regression coefficients for the remaining variables in the analysis are comparable to those of the CAPEX model, except that ROA is no longer statistically significant. The correlation between the level of growth opportunities and R&D is positive and statistically significant as well. There is a difference between the CAPEX regression and the R&D model for cash variable. The R&D estimates suggest a positive relationship between cash holdings and a change in R&D investments, opposed to the negative relation presented in CAPEX analysis.

The estimates presented in table 5 include the levels of R-squared in each regression. These levels are similar to the ones presented in table 3. This suggests that both the CAPEX model and the R&D model have a higher explanatory power for differences in investment levels in comparison the employment regression. In summary, the analysis of investment behaviour of share repurchasing firms provides evidence in accordance to the claims of critics. The regression estimates for each of the three investment proxies show negative correlations between repurchases and investments. This implies that companies that buy back their own stock, lower their investments in productive assets compared to prior levels. The size of the coefficients indicate that this effect is the highest for capital expenditures. These findings support the fourth hypothesis of repurchases and associated reductions in investments.

Table 5. Regression of R&D on share repurchases

This table reports the coefficient estimates of the cross-sectional time-series OLS regression of the change in R&D on repurchases (RYIELD). Next to RYIELD, the regression is also performed using a dummy variable for repurchases (REPODUM), which takes the value of one in case repurchases have been made. The change in R&D is calculated as described in section 5.3, and is defined as the difference between the average level of R&D in the years after and prior to each firm-observation. Three different evaluation periods are used to capture the difference in investment level: 1 year, 3 years, and 5 years. The control variables are log(MV), ROA, CASH, and DEBT. I use Tobin's q (Q) as a proxy for investment opportunities to control for variances in these opportunities. Furthermore, I control for investment variances across industries by using industry-indicator variables. Year-indicator variables are added to the regression to control for variances over time. The regression model is defined as follows:

$$\overline{R\&D}_{i,(t+1,t+n)} - \overline{R\&D}_{i,(t-1,t-n)} = \beta_0 + \beta_1 RYIELD_{i,t} + \beta_2\, log(MV)_{i,t} + \beta_3 ROA_{i,t} + \beta_4 CASH_{i,t} + \beta_5 DEBT_{i,t} + \beta_6 Q_{i,t} + IndustryDUM + YearDUM + \varepsilon_{i,t}$$

The variables RYIELD, CASH, DEBT, and Q are winsorized at a 99th percentile. The variable ROA is winsorized at a 1st and 99th percentile. The sample includes all 803 firms that have paid dividends regularly and made repurchases at least once between 1980 and 2014. The firm data is pooled, and the standard errors are clustered at firm level. The table reports the coefficient estimates and p-values (parentheses). The estimates [a],[b],and [c] are significant at a 1%, 5%, and 10% level.

Dependent variable:	Δ R&D (1yr)		Δ R&D (3yrs)		Δ R&D (5yrs)	
	(1)		(2)		(3)	
RYIELD	**-0.019[a]**		**-0.047[a]**		**-0.097[a]**	
	(0.000)		(0.000)		(0.000)	
REPODUM		**-0.001[a]**		**-0.003[a]**		**-0.006[a]**
		(0.006)		(0.001)		(0.005)
log(MV)	-0.000	-0.000	-0.001	-0.000	-0.000	-0.000
	(0.871)	(0.754)	(0.805)	(0.921)	(0.851)	(0.972)
ROA	0.004	0.004	0.020	0.021	0.037	0.038
	(0.410)	(0.383)	(0.127)	(0.123)	(0.216)	(0.209)
CASH	**0.006[c]**	**0.006[c]**	**0.018[b]**	**0.018[b]**	**0.027[b]**	**0.027[b]**
	(0.056)	(0.061)	(0.011)	(0.012)	(0.036)	(0.038)
DEBT	**-0.005[b]**	**-0.005[a]**	-0.006	-0.007	-0.013	**-0.016[c]**
	(0.015)	(0.009)	(0.191)	(0.127)	(0.128)	(0.081)
Q	**0.004[a]**	**0.004[a]**	**0.008[a]**	**0.008[a]**	**0.014[a]**	**0.014[a]**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year-indicator variables	yes	yes	yes	yes	yes	yes
Industry-indicator variables	yes	yes	yes	yes	yes	yes
R-squared	0.084	0.084	0.174	0.175	0.191	0.191
Observations	12,026	12,026	9,803	9,803	7,824	7,824

7. Conclusion

Share repurchase activity has grown rapidly since 1980, and nowadays its total value exceeds the total amount of dividend payments. Repurchases have become an increasingly popular method for transferring wealth to shareholders. This study showed that the proprotion of earnings paid out to equity holders increased between 1980 and 2014. During this period, the fraction of firms that pay dividends only (without repurchasing shares) has decreased significantly. At the same time, there has been an increase in the number of firms that pay dividends in combination with making repurchases and the number of firms that payout through repurchases only (without paying dividends). These trends raise doubts about excessive corporate payouts to shareholders, which could harm investments in productive assets. This paper examines the use of repurchases and its effects on investments.

Previous research has shown support for the substitution hypothesis, which states that firms use share buybacks as a substitute for dividends payments (Grullon and Michaely, 2002; Skinner, 2008). Using a similar methodology, I continue the analysis of the substitution hypothesis by covering more recent years. The findings of this study are in agreement with the earlier findings of replacing dividend payments by share repurchases. By forecasting dividend payments, I have shown that firms use resources on repurchases that could otherwise have been used to increase dividends. Furthermore, I compare two different models to examine the responsiveness of payouts to earnings. The evidence suggest that total payout model, which comprises of both dividends and repurchases, better tracks earnings compared to the traditional dividend model. This shows that managers use the flexibility of share buybacks to deal with variances in earnings.

The main goal of this study is to test the effects of repurchase programs on investment behaviour. In this research, I make use of three proxies for investments in productive assets; capital expenditures, employment, and R&D. The results in section 6.2 show a negative correlation between repurchases and changes in each of the investment variables. This effect seems stronger for capital expenditures than for the other two measures. Furthermore, the negative relationship becomes greater as the investment evaluation period becomes longer. So the effects of repurchases on investments seem to be persistent over time. All in all, the evidence in this study supports the notion that repurchasing shares is associated with lower corporate investments.

This study builds on previous research that examines trends in dividend paying and share repurchasing behaviour. I test the substitution hypothesis on more recent data and by combining the methodology of previous papers. Investigating the effects on investment behaviour is the focal point of my paper. Lazonick (2014) questioned the practice of share buybacks and linked its use to reductions in investments. However, his work did not involve an in depth empirical analysis of these consequences. Almeida, Fos, and Kronlund (2015) examined the effects of repurchases for firms using them to meet EPS expectations. I extend their research by analyzing firms that use repurchases as a payout method. My work has similar implications as Almeida, Fos, and Kronlund, and supports the claims of Lazonick.

The findings of this study have some important implications for different stakeholders. First of all, transferring wealth through dividends or repurchases has consequences as the level of taxes differs for dividends and capital gains. Therefore, confirming the substitution hypothesis does not only have implications for firms themselves, but also affects investors and (tax) authorities. Especially for the latter group, as they experience lower tax incomes from corporate payouts if cash is transferred via repurchases. The results might also pose some concerns on the ease at which firms can buyback stocks, and potentially manipulate its stock price. Perhaps more significant are the implications of the associated lower levels of investments. Lazonick (2014) raised serious concerns about the magnitude of corporate payouts. He argues that stock markets have been recovering from the recession, but due to excessive corporate payouts this prosperity has not been shared with the American middle class. Lazonick points out that firms are funding the stock market rather than vice versa. This study shows that firms might indeed be more concerned with meeting the expectations of investors, rather than investing in productive assets. This behaviour could not only affect the working class, but could also harm long term economic growth.

My research examines the investment behaviour for firms that use repurchases in order to transfer cash to its equityholders. Before I investigated the changes in investment behaviour, I tested the sample of firms for the substitution hypothesis. I confirmed its practice on a rather aggregate level, not for each firm individually. The hypothesis was confirmed over the total sample of firms under investigation. For a more in depth analysis of differences in investments between repurchasing and non-repurchasing firms, one could compare its practice among different companies. In other words, first assess whether an individual firm buys back stock in order to transfer wealth, then compare the changes in investments among different groups of firms.

One of the most important challenges of researching investment behaviour, is to control for differences in investment opportunities among firms. As denoted earlier, increasing payouts to shareholders does not always harm companies, for example in case growth opportunities are low. On the contrary, in this setting resources might be even more useful in the hands of investors. I control for growth opportunities using a measure of Tobin's q. Although this proxy is widely used, it does not capture opportunities for each firm perfectly. In the attempt to control for the growth capacity of firms, I also use industry-indicator variables, capturing variances in investment levels for different industries. An estimation of investment or growth opportunities is rather challenging, perhaps assessing these opportunities can be done more accurately if performed on an individual firm level. Although, this might be time-consuming and could involve an examination of qualitative firm information as well.

Instead of taking an aggregate approach as done in this study, future research might focus on individual firm behaviour. Research shows that more recently found firms withhold from paying dividends at all, and perhaps dividends might even disappear completely. The observed payout behaviour has some serious implications for different stakeholders. Assessing the consequences of taxable differences associated with the increased use of repurchases is just one approach. It might be interesting to investigate the effects on both investors and authorities. Finally, the most challenging task is to assess the economic consequences of the tendency to increase payouts and lower investments. This does not only involve examining the long term effects at firm level, but also for the economy as a whole. After this has been done, one could truly make justifiable claims on the use of share repurchases.

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Appendix

Table A1. Summary statistics

This table reports the summary statistics for a sample of 162,153 firms, including public U.S. firms (excl. financials and utility companies) for the period 1980-2014. Panel A presents the descriptive statistics on corporate payouts. Dividends are measured in both absolute terms (DIV) and relative to the market value of equity (DYIELD). Share repurchases are measured by the increase in treasury stock. In case firms do not report share repurchases via changes in treasury stock, it is measured as the difference between purchases of stock and the sale of stock. Repurchases are set to zero if either of the two measures is negative. Again, the amounts of repurchases are reported in absolute (REPO) and relative (RYIELD) terms. The dummy variable (REPODUM) takes a value of one for repurchases larger than zero. Panel B reports the descriptive statistics on firm characteristics. The variables for total cash, total debt, returns and nonoperating income have been scaled by total assets. Panel C reports the descriptive statistics on the investment variables. The three different proxies for investments are capital expenditures (CAPEX), number of employees (EMP), and R&D. Capital expenditures comprise of the total funds used for additions in property, plants and equipment. R&D reflects all costs incurred during a fiscal year for the development of new products and services. Each of the three proxies is scaled by total assets. Tobin's q is measured as the market value of equity plus the book value of liabilities divided by the book value of equity.

	Abbreviation	Mean	SD	p1	p5	p25	p50	p75	p95	p99	N
Panel A: Payout statistics											
Dividends ($ in millions)	DIV	28.08	277.83	0.00	0.00	0.00	0.00	0.56	63.28	549.00	162,153
if dividends > 0:											
Dividends ($ in millions)		97.24	510.50	0.03	0.18	1.46	6.56	33.68	347.00	1743.00	46,821
Dividends / Market value	DYIELD	12.6%	13.3%	0.1%	0.4%	1.3%	2.3%	3.8%	8.2%	21.3%	43,033
Net repurchases ($ in millions)	REPO	29.48	393.63	0.00	0.00	0.00	0.00	0.00	41.31	536.54	162,153
Repurchases dummy (indicator)	REPODUM	0.22	0.41	0.00	0.00	0.00	0.00	0.00	1.00	1.00	162,153
if repurchases > 0:											
Repurchases ($ in millions)		134.58	832.64	0.00	0.01	0.36	3.44	32.88	486.00	2623.30	35,517
Repurchases / Market value	RYIELD	9.8%	5.3%	0.0%	0.0%	0.5%	1.9%	4.6%	14.4%	36.8%	34,267

Table A1 - *cont.*	Abbreviation	Mean	SD	p1	p5	p25	p50	p75	p95	p99	N
Panel B: Firm characteristics											
Market value ($ in millions)	MV	1590.23	11983.70	0.29	1.51	13.09	65.38	399.43	4757.76	28105.55	162,153
Assets ($ in millions)	AT	1500.90	11390.11	0.06	1.44	14.70	76.36	422.10	4892.00	25734.01	162,151
Earnings ($ in millions)	EARN	64.35	796.04	-264.37	-40.38	-2.11	0.89	14.02	238.70	1468.00	162,153
Cash / Assets	CASH	18.3%	23.4%	0.0%	0.3%	2.5%	8.7%	25.4%	71.6%	95.2%	161,649
Debt / Assets	DEBT	37.8%	11.3%	0.0%	0.0%	0.9%	14.7%	32.3%	67.6%	161.4%	158,610
Return on Assets	ROA	-1.1%	69.5%	-688.3%	-88.7%	-2.1%	9.8%	16.5%	27.8%	40.9%	161,312
Nonoperating income / Assets	NOPER	-17.4%	65.2%	-14.6%	-1.0%	0.0%	0.6%	1.8%	5.7%	19.7%	161,666
Panel C: Investment statistics											
Capital expenditures / Assets	CAPEX	7.3%	90.5%	0.0%	0.1%	1.8%	4.1%	8.3%	22.9%	45.5%	160,072
Employees / Assets (per $ million)	EMP	6.74	33.20	0.00	0.01	0.10	0.56	3.08	29.00	109.55	155,908
R&D / Assets	R&D	23.3%	9.8%	0.0%	0.0%	0.5%	3.6%	11.1%	43.1%	139.4%	91,778
Tobin's q	Q	2.12	1.07	0.53	0.76	1.07	1.47	2.42	8.67	72.21	160,957

Table A2. Correlation matrix

Table 2 reports the correlation coefficients for the different variables presented in table A1.

	DIV	DYIELD	REPO	REPODUM	RYIELD	MV	AT	EARN	CASH	DEBT	ROA	NOPER	CAPEX	EMP	R&D	Q
DIV	1.000															
DYIELD	0.121	1.000														
REPO	0.597	0.032	1.000													
REPODUM	0.118	0.081	0.152	1.000												
RYIELD	0.000	-0.001	0.001	0.016	1.000											
MV	0.730	0.051	0.602	0.130	0.000	1.000										
AT	0.774	0.071	0.456	0.101	0.000	0.646	1.000									
EARN	0.726	0.056	0.634	0.120	0.000	0.699	0.599	1.000								
CASH	-0.051	-0.089	-0.022	-0.085	-0.005	-0.032	-0.058	-0.036	1.000							
DEBT	-0.001	-0.003	-0.001	-0.007	0.000	-0.002	-0.001	-0.001	0.008	1.000						
ROA	0.002	0.004	0.001	0.007	0.000	0.002	0.002	0.002	-0.004	-0.022	1.000					
NOPER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.004	0.138	-0.023	1.000				
CAPEX	-0.002	-0.002	-0.003	-0.007	-0.001	-0.003	-0.004	-0.001	-0.046	0.208	-0.048	0.001	1.000			
EMP	-0.014	-0.001	-0.010	-0.019	-0.001	-0.016	-0.015	-0.011	-0.019	0.237	-0.148	0.075	0.047	1.000		
R&D	-0.002	-0.006	-0.002	-0.010	0.000	-0.003	-0.003	-0.002	0.012	0.006	-0.191	0.015	-0.002	0.119	1.000	
Q	0.002	-0.001	0.001	0.000	0.000	0.006	0.002	0.002	0.007	-0.001	0.001	0.000	0.001	-0.001	-0.006	1.000

Table A3. Aggregate payout to shareholders

This table reports the aggregate earnings, dividends, and repurchases for of all public U.S. firms (excluding financials and utility companies) over the period 1980 to 2014. Similar to Grullon and Michaely (2002), it reports dividends and repurchase as a percentage of earnings and market value. The last column shows the relative size of aggregate repurchases relative to dividends. Earnings (EARN) are defined as total earnings before extraordinary items (Compustat item IB). The market value (MV) represents the market value of common shares multiplied by the period-end price (Compustat item MKVALT). Dividends (DIV) is defined as the total amount of dividends declared on all equity capital (Compustat item DVT). This measure excludes payouts in form of stock dividends. Finally, repurchases are measured using a similar approach as Fama and French (2001) and Skinner (2008). First, net repurchases (REPO) during the fiscal year are measured as the increase in common treasury stock (Compustat item TSTKC). Not all firms report stock repurchases using this treasury stock method, and in these cases repurchases are measured as the difference between the purchases of stock (Compustat item PRSTKC) and the sale of stock (Compustat item SSTK). If either of the two measures (using treasury stock of the purchase and sale of stock) is negative, the amount of repurchases is set to zero. The total sample consists of 162,153 firm-year observations.

Year	Σ EARN ($ millions)	Σ DIV ($ millions)	Σ REPO ($ millions)	Σ DIV/ Σ EARN (%)	Σ REPO/ Σ EARN (%)	Σ DIV/ Σ MV (%)	Σ REPO/ Σ MV (%)	Σ REPO/ Σ DIV (%)
1980	92,563	33,368	3,769	36.05	4.07	3.48	0.39	11.30
1981	95,339	36,253	4,596	38.03	4.82	4.19	0.53	12.68
1982	71,443	36,346	6,765	50.87	9.47	3.73	0.69	18.61
1983	92,044	42,191	5,882	45.84	6.39	3.15	0.44	13.94
1984	111,470	47,102	23,129	42.25	20.75	3.66	1.80	49.10
1985	90,679	48,450	27,123	53.43	29.91	3.15	1.76	55.98
1986	83,001	58,804	24,060	70.85	28.99	3.20	1.31	40.92
1987	113,843	60,922	34,449	53.51	30.26	3.25	1.84	56.55
1988	145,688	73,348	33,087	50.35	22.71	3.66	1.65	45.11
1989	138,016	69,354	26,173	50.25	18.96	2.91	1.10	37.74
1990	123,651	70,324	26,726	56.87	21.61	3.16	1.20	38.00
1991	87,238	70,039	14,338	80.28	16.43	2.44	0.50	20.47
1992	106,619	74,234	18,342	69.63	17.20	2.39	0.59	24.71
1993	121,932	76,368	18,438	62.63	15.12	2.13	0.51	24.14
1994	193,009	76,695	25,864	39.74	13.40	2.15	0.73	33.72
1995	213,177	93,571	51,315	43.89	24.07	1.94	1.06	54.84
1996	247,350	94,122	56,990	38.05	23.04	1.62	0.98	60.55
1997	250,156	92,541	81,426	36.99	32.55	1.28	1.12	87.99
1998	228,523	99,311	110,621	43.46	48.41	1.14	1.26	111.39
1999	273,095	99,157	129,182	36.31	47.30	0.89	1.15	130.28
2000	249,783	103,931	124,944	41.61	50.02	0.95	1.15	120.22
2001	(48,776)	99,133	83,535	-203.24	-171.26	0.89	0.75	84.27
2002	87,146	104,954	85,787	120.43	98.44	1.40	1.15	81.74
2003	330,992	113,555	99,217	34.31	29.98	1.22	1.07	87.37
2004	395,853	136,468	147,713	34.47	37.32	1.31	1.42	108.24
2005	469,208	184,273	239,782	39.27	51.10	1.72	2.24	130.12
2006	595,256	179,084	377,415	30.09	63.40	1.49	3.15	210.75
2007	498,796	198,793	406,244	39.85	81.44	1.59	3.25	204.36
2008	246,889	197,013	297,771	79.80	120.61	2.34	3.54	151.14
2009	516,333	191,599	120,565	37.11	23.35	1.95	1.23	62.93
2010	678,839	202,220	205,046	29.79	30.21	1.74	1.77	101.40
2011	716,714	227,403	327,528	31.73	45.70	2.03	2.92	144.03
2012	686,759	273,800	279,297	39.87	40.67	2.12	2.17	102.01
2013	772,215	292,939	361,945	37.93	46.87	1.85	2.29	123.56
2014	750,885	319,011	438,899	42.48	58.45	1.81	2.49	137.58

Table A4. Distribution of firms sorted into payout policy groups (in periods)

This table reports the distribution of all public U.S. firms (excluding financials and utility companies) over the period 1980 to 2014 sorted into different groups according to payout policy. The groupings are based on the number of years in which a firm paid dividends and repurchased shares. The table presents the distribution for three different periods: 1980-1991, 1992-2003, and 2004-2014. Panel A displays the distribution in number of firms and its fraction (in parentheses). The distribution in panel B shows the total value of payout (in $ millions) and its fraction (in parentheses) for each group.

Panel A: Number (fraction) of firms into payout groups

Number of years of repurchases	Number of years of dividends				
	0	1-6	7-11	12	Sum
1980-1991					
0	3,494	857	131	64	4,546
	(0.415)	(0.102)	(0.0156)	(0.008)	(0.540)
1-6	1,665	1,048	505	431	3,649
	(0.198)	(0.125)	(0.060)	(0.051)	(0.434)
7-12	29	27	49	116	221
	(0.003)	(0.003)	(0.006)	(0.014)	(0.026)
Sum	5,188	1,932	685	611	8,416
	(0.616)	(0.230)	(0.081)	(0.073)	(1.000)
1992-2003					
0	4,831	594	73	32	5,530
	(0.487)	(0.060)	(0.007)	(0.003)	(0.557)
1-6	2,547	825	367	254	3,993
	(0.257)	(0.083)	(0.037)	(0.026)	(0.402)
7-12	88	43	84	185	400
	(0.009)	(0.004)	(0.008)	(0.019)	(0.040)
Sum	7,466	1,462	524	471	9,923
	(0.752)	(0.147)	(0.053)	(0.047)	(1.000)
2004-2014	0	1-5	6-10	11	Sum
0	3,638	403	65	41	4,147
	(0.512)	(0.057)	(0.009)	(0.006)	(0.584)
1-6	1,388	591	224	226	2,429
	(0.195)	(0.083)	(0.032)	(0.032)	(0.342)
7-11	139	99	79	214	531
	(0.020)	(0.014)	(0.011)	(0.030)	(0.075)
Sum	5,165	1,093	368	481	7,107
	(0.727)	(0.154)	(0.052)	(0.068)	(1.000)

Table A4 - *cont.*

Panel B:Total value of payout (in $ millions) for each payout group

Number of years of repurchases	Number of years of dividends				
	0	1-6	7-11	12	Sum
1980-1991					
0	0	7,233	1,849	868	9,951
	(0.000)	(0.075)	(0.019)	(0.009)	(0.103)
1-6	1,767	15,411	21,894	27,426	66,497
	(0.018)	(0.160)	(0.228)	(0.285)	(0.691)
7-12	42	186	6,764	12,757	19,749
	(0.000)	(0.002)	(0.070)	(0.133)	(0.205)
Sum	1,809	22,831	30,507	41,052	96,198
	(0.019)	(0.237)	(0.317)	(0.426)	(1.000)
1992-2003					
0	0	10,323	3,187	1,445	14,955
	(0.000)	(0.053)	(0.016)	(0.007)	(0.077)
1-6	11,404	29,472	23,602	34,164	98,642
	(0.058)	(0.151)	(0.121)	(0.175)	(0.506)
7-12	3,343	814	4,658	72,576	81,392
	(0.017)	(0.004)	(0.024)	(0.372)	(0.417)
Sum	14,747	40,609	31,447	108,186	194,989
	(0.076)	(0.208)	(0.161)	(0.555)	(1.000)
2004-2014		1-5	6-10	11	Sum
0	0	15,002	5,343	3,737	24,081
	(0.000)	(0.028)	(0.010)	(0.007)	(0.045)
1-6	18,429	62,110	40,219	72,251	193,009
	(0.034)	(0.115)	(0.074)	(0.134)	(0.358)
7-11	19,979	30,054	26,521	246,764	323,318
	(0.037)	(0.056)	(0.049)	(0.457)	(0.598)
Sum	38,407	107,166	72,083	32,2752	540,408
	(0.071)	(0.198)	(0.133)	(0.597)	(1.000)

Table A5. Distribution of firms sorted into payout policy groups (1980-2014)

This table reports the distribution of all public U.S. firms (excluding financials and utility companies) over the period 1980 to 2014 sorted into different groups according to payout policy. The groupings are based on the number of years in which a firm paid dividends and repurchased shares. In contrast to the table A4, this table shows one single distribution for the entire research period. The table shows the distribution in number of firms falling in each group.

Number of years of repurchases	Number of years of dividends						
	0	1-6	7-12	13-18	19-24	>24	Sum
0	7,426	1,180	164	30	8	6	8,814
1-6	3,739	1,654	609	211	119	54	6,386
7-12	269	251	201	148	113	152	1,134
13-18	41	48	38	24	60	142	353
19-24	5	9	7	7	10	105	143
> 24	1	1	1	2	4	44	53
Sum	11,481	3,143	1,020	422	314	503	16,883