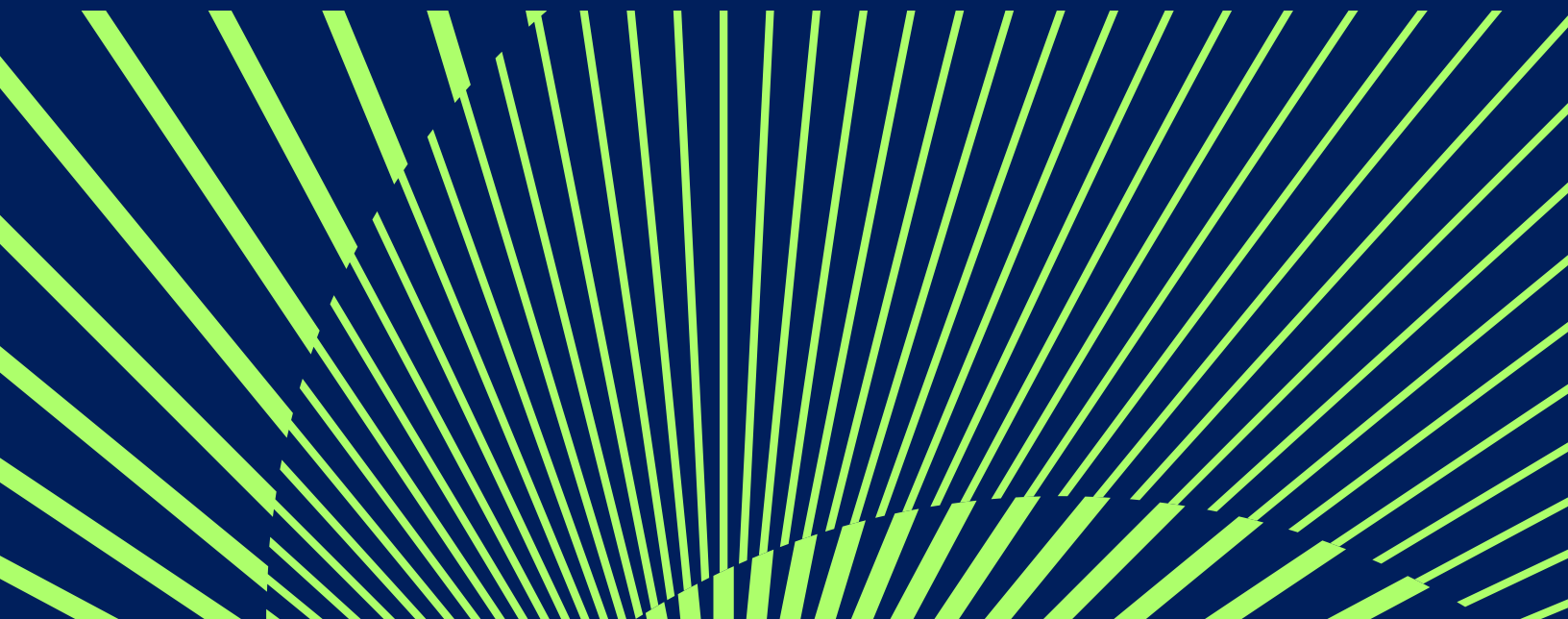
U.S. Chamber of Commerce
Center for Capital Markets
Competitiveness

Fall 2021 Report

Corporate Liquidity Provision &

Share Repurchase Programs

By: Craig M. Lewis & Joshua T. White



Craig Lewis

Madison S. Wigginton Professor of Finance
Owen Graduate School of Management
Vanderbilt University

Joshua T. White

Assistant Professor of Finance
Owen Graduate School of Management
Vanderbilt University

September 24, 2021

This report was commissioned by the U.S. Chamber of Commerce.

Executive Summary

Corporations use stock buybacks as a means to unlock value by returning surplus cash to investors. In turn, these investors can deploy the capital to more productive uses.

The popularity of stock buyback programs has attracted significant attention from academics, policymakers, and practitioners. Some vocal opponents conjecture that stock buybacks necessarily reduce investment and harm non-investor stakeholders such as employees. Although a large body of academic literature overwhelmingly refutes these claims, such vocal criticisms persist and have led some to calls for limits via taxing stock buybacks or outright bans on open market repurchases.

In this study, we present large sample evidence showing that stock buybacks have a beneficial but often overlooked effect on stock price stabilization. Using a broad sample of over 10,000 U.S.-listed companies across a 17-year sample period of 2004 to 2020, we present strong evidence that managers strategically utilize share repurchases to increase stock liquidity and reduce volatility. The resulting stabilization in stock prices benefits all investors—including retail investors, who now account for over 20% of trading volume in U.S. equities.

Our analyses of stock buybacks have six key takeaways:

1. Greater liquidity: Companies repurchasing stock provides substantial liquidity that facilitates orderly trading and reduces transaction costs for retail investors.
2. Reduced volatility: Stock buybacks significantly reduce realized and anticipated return volatility. Imposing limitations on buyback activity would increase stock market volatility and force retail investors to bear greater amounts of downside risk.
3. Retail investors benefit: Stock buybacks generate an economically large benefit for retail investors. Since 2004, buybacks have saved retail investors $2.1–4.2 billion in transaction and price impact costs.
4. Proactive repurchase activity: Managers utilize market-based estimates of future volatility to inform their buyback decisions. When volatility is expected to be higher, managers increase their buyback intensity to stabilize stock prices, thus reducing costs for retail investors.
5. Response to uncertainty: Studies show that economic policy uncertainty increases stock price volatility and illiquidity. Managers respond to elevated policy uncertainty by strengthening their buyback activities. Retail investors benefit from price certainty about the value of their investments during periods of greater uncertainty.
6. Strategic liquidity supplier: Managers expand stock buyback activity during critical periods when investors sell relatively large amounts of shares. Thus, managers use buybacks to actively mitigate price pressure during periods of net selling pressure.

Overall, our analyses demonstrate the beneficial impact of stock buybacks on stock liquidity and volatility. To appreciate the market stabilization benefit of buybacks, it is important to understand what stock liquidity and volatility represent. A stock is considered to be liquid if buyers and sellers can transact quickly with low price impact. Highly liquid stocks also have more stable prices and thus lower stock price volatility. Our study shows that stock buybacks enhance liquidity and lower volatility. This allows all investors—institutional and retail—to buy and sell without having a large price impact.

Stock liquidity is especially beneficial to investors during periods of greater uncertainty when, for example, some institutional investors (e.g., index funds) must transact in stocks due to fund flows in and out of their portfolio. Retail investors also benefit from more stable stock prices as it allows them to sell stocks closer to the intrinsic value even during periods of higher uncertainty. By providing price support during periods when selling pressure is relatively high, buybacks benefit investors by reducing the downside risk of their investment.

Much of the rhetoric that surrounds the current debate on stock buybacks focuses on perceived advantages conferred to wealthy shareholders. For example, U.S. Sen. Sherrod Brown, the current chair of the Senate Committee on Banking, Housing and Urban Affairs, recently commented, "Today, much of that capital is funneled back to wealthy executives in the form of stock buybacks—which used to be illegal market manipulation—and only about 15 percent goes to the real economy."[1]

Contrary to the "political" view that share repurchase programs are self-serving mechanisms for inflating executive compensation, the evidence introduced by our study overwhelmingly supports the notion that managers use stock buybacks as a market stabilizing force, especially during uncertain and volatile periods. Price stabilization is a benefit that is conferred to all shareholders, including retail investors, regardless of whether they buy and sell stock in their own accounts or participate indirectly through investment in retirement accounts. We quantify the liquidity and volatility benefits of buybacks and estimate that retail investors save $2.1–4.3 billion during our full sample period. These benefits equate to $126–253 million in retail investor savings per year.

Therefore, our results have important policy implications for the contemporaneous discussions on buyback activity. Based on our findings, imposing any limitations or taxes on corporate share repurchases will curb managers' ability to supply liquidity and reduce volatility during crucial periods of uncertainty, which would ultimately harm retail investors by forcing them to incur additional transaction costs and bear greater downside risk.

1. See "Brown, Wyden unveil major new legislation to tax stock buybacks," September 10, 2021, available at https://www.brown.senate.gov/newsroom/press/release/brown-wyden-tax-stock-buybacks. Sen. Brown's comment ignores the fact that the funds directed to stock buybacks are reallocated within the economy, likely to companies that are better able to put the money to use in profitable opportunities that create even more jobs (see, e.g., Fried and Wang, 2018).

Table of Contents

1. Introduction

Corporate payouts attract significant interest from investors, lawmakers, and academics.[2] A debate continues to surround a specific type of payout: share repurchase programs. Proponents argue that the distribution of excess cash reserves creates incentives for managers to make efficient capital investments; signals undervalued share prices; allows investors to liquidate equity positions in a tax-efficient manner; and redirects aggregate investment capital to young, growing companies with valuable investment opportunities that should ultimately lead to job creation. By contrast, opponents argue that share repurchase plans cause artificial price inflation, lead to inadequate future investment, are an artifact of managerial short-termism, and disproportionately benefit wealthy investors and corporate insiders at the expense of employees.

This study examines the *price stabilization* role of share repurchase programs. The possibility that companies can strategically reduce volatility or provide liquidity during uncertain periods has received limited attention in the contemporaneous debate on repurchases. However, some in the media conjecture that a widespread pause in stock buyback activity can lead to market volatility.[3]

Several academic papers examine the link between stock buybacks and liquidity, but often focus on the liquidity role of market-makers rather than corporations during repurchasing events. Empirical findings on this relation are dated and mixed. For example, a number of studies report a negative relation between stock repurchases and liquidity as evidenced by widening bid-ask spreads following a share repurchase announcement (e.g., Barclay and Smith, 1988; Brockman and Chung, 2001). These papers argue that market-makers demand compensation for transacting against potentially informed insiders during repurchase programs, which results in widening spreads. A second set of studies employs varying sample sizes, research designs, and sample periods, and reports small or no relation between buyback announcements and bid-ask spreads (e.g., Singh et al., 1994, Wiggins, 1994; Miller and McConnell, 1995; Franz et al., 1995).

In contrast to these findings, two studies focusing on the liquidity role of corporations through buybacks provide suggestive evidence that share repurchases can have a *beneficial* impact on stock liquidity. Cook et al. (2004) examine a sample of 64 firms that provide daily repurchase data and find some improvements in bid-ask spreads and attenuations in the price impact of order imbalances. They argue that by supplying liquidity during times when there is net selling pressure, managers can actively mitigate the price impact. Hillert et al. (2016) find similar results using a large sample of buyback activities between 2004 and 2010.

2. Throughout this study we use the terms "buybacks," "stock buybacks," "repurchases," and "share repurchases" interchangeably to describe the corporate payout policy decision to repurchase equity from existing shareholders.
3. See, e.g., Erik Sherman, "Stock buybacks drop may mean more market volatility," *Fortune*, July 3, 2019, available at https://fortune.com/2019/07/03/share-buybacks-slowdown/.

Motivated by the mixed findings and small or dated samples in existing studies, we revisit the relation between stock buybacks, liquidity, and volatility using a large sample of over 10,000 U.S.-listed firms over the 17-year period 2004 to 2020.[4] Our sample period encompasses significant changes in technology, market microstructure, and the ownership structure of U.S.-listed firms via the rise in passive indexers and retail traders. Thus, we compute a wide range of variables intended to capture multiple dimensions of buyback activities, liquidity, and volatility. We also use an econometric technique to adjust our estimates for other factors that could influence these outcomes.[5]

By announcing the initiation of a share repurchase program, a firm effectively notifies investors that it plans to open a window when investors can be reasonably confident that they can liquidate positions without being unduly concerned about negative price impact. Similar to Benveniste et al. (1996), we argue that share repurchase programs implicitly provide liquidating shareholders with a put option that allows them to sell at the current market price.[6] The benefit derived from corporate liquidity provision is similar to underwriter efforts to stabilize prices of newly listed firms immediately following initial public offerings (IPOs).[7] The main difference is that the firms purchase the shares in a stock buyback rather than the underwriter in an IPO. In both cases, the entity purchasing shares can strategically decide when to enter the market. The marginal benefit of this action should be larger during periods of elevated uncertainty and when downward price pressure is the strongest.

Based on these arguments, our main prediction is that managers will repurchase shares when trading is characterized by a period of illiquidity and that strategic repurchasing will reduce stock market volatility all else equal. By limiting downside risk, buyback-induced reductions in volatility are especially beneficial to retail investors. Similarly, greater stock liquidity reduces transaction costs of investing, which benefits all shareholders, especially retail traders who tend to transact more frequently (Odean, 1999; Barber and Odean, 2000; Eaton et al., 2021).

We perform a regression analysis on several liquidity proxies and find that, as predicted, managers actively repurchase shares during periods when selling pressure is relatively high. When firms repurchase shares, their actions improve liquidity, thereby reducing transaction costs. We also find that these effects are an increasing function of buyback intensity (percentage of shares repurchased relative to shares outstanding). All of these findings are consistent with our hypothesis that share repurchase programs provide liquidity.

We next consider the impact on stock price volatility. We use three measures of volatility: historical volatility, implied volatility, and abnormal return volatility. The latter measure focuses on firm-specific

4. We start our sample in the first quarter of 2004 (1Q04) because the U.S. Securities and Exchange Commission (SEC) began requiring reporting issuers to provide quarterly disclosure of all share repurchases for issuers with fiscal periods ending on or after March 15, 2004. See SEC, Purchases of Certain Equity Securities by the Issuer and Others, Final Rule, November 10, 2003, available at https://www.sec.gov/rules/final/33-8335.htm.
5. Our regression models include standard control variables used in tests of liquidity and volatility, calendar-quarter fixed effects to control for time-varying factors that could influence liquidity and volatility; and industry fixed effects to control for time-invariant factors that could impact these outcomes.
6. Benveniste et al. (1996) argue that underwriter price stabilization following an initial public offering provides institutional investors with a put option as implicit compensation for revealing private information during the pre-offer period.
7. Lewellen (2006) documents that there is a substantial amount of price support in the IPO market.

risk by netting out the volatility of the overall market. We show that, regardless of the volatility metric, stock return volatility tends to be lower during periods when managers are actively repurchasing shares. Moreover, the magnitude of the volatility reduction is larger when the company repurchases a greater percentage of shares. These findings are consistent with the prediction that strategically timed share repurchases effectively provide price support by reducing the risk of stock price declines. This result does not, however, imply that repurchase programs prevent stock prices from reaching their fundamental values. Instead, it suggests that buybacks limit liquidity-induced losses and reduce transaction costs for investors.

We also provide estimates of the economic benefits to retail investors due to repurchase activity. Studies and news articles show that retail investors account for a growing portion of stock market activity in the U.S. Estimates of retail investor trading volume range from 10% to 14% before commission free trading was introduced, and more than 20% by the end of our sample period. We estimate net savings of $2.1–4.2 billion during our sample period, most of which stems from reduced stock price volatility.

We also consider whether managers are more likely to repurchase shares during periods when near-term volatility is expected to be high relative to longer-term volatility forecasts. Using the implied volatility of short- and medium-term stock options, we predict and find that managers tend to engage in more buyback activities and strengthen the intensity of their repurchases when short-term implied volatility is relatively higher than long-term implied volatility.

We then examine periods of high political uncertainty, which prior work links to deteriorations in overall market quality and liquidity (Pasquariello and Zafeiridou, 2014). We find that when political uncertainty is high, firms with existing buyback programs are more likely to repurchase shares. We also show that firms are less likely to initiate a new buyback program during this period, perhaps due to the uncertainty of future tax or governmental policies. A graphical examination of the time series of buybacks shows that firms tend to increase the intensity of share repurchase activity just before a U.S. presidential election period. This finding is also consistent with managers using share repurchases to provide liquidity during uncertain times.

Finally, we test a “liquidity windows hypothesis” by examining whether managers alter repurchase activity during periods when institutional investors are selling more shares. We hypothesize and find that managers tend to strengthen repurchase activities when institutional selling is high. We interpret this finding as evidence that managers supply liquidity to markets by attenuating volatility pressures due to institutional selling.

Taken together, we provide substantial evidence that managers strategically use share repurchase programs to stabilize stock price and provide liquidity during periods of uncertainty. These activities mitigate share price declines and benefit the firm’s investors by reducing transaction costs and reducing downside liquidity risk. Thus, our study provides timely evidence that should be considered in the contemporaneous debate on stock

buyback activity. Based on our findings, any imposition of limits on stock buyback activity would reduce stock liquidity, elevate return volatility, and introduce risk that ultimately harms the company's investor base, which includes a substantial and growing portion of retail investors.

The rest of the paper is organized as follows: Section 2 discusses the economics of buybacks and the contemporaneous debate surrounding stock buybacks, and reviews the relevant literature. Section 3 describes the data and the metrics used in our analysis. Section 4 discusses our main results. Section 5 offers additional analyses. We conclude in Section 6.

2. Background Information

A. The Economics of Buybacks

Stock buybacks are corporate payout policy decisions designed to return excess cash to shareholders. A firm that follows an optimal investment policy will first allocate capital to new and existing investments that increase firm value. Once a company invests in all projects that have a positive net present value, it will consider whether it should return any surplus cash to shareholders since further investment would likely reduce firm value. In other words, value would be reduced if firms continued to invest by directing capital to projects that earn less than the opportunity cost of capital. Rather than make value-destroying investments, firms can return surplus cash to shareholders that can then use the returned capital to invest in other companies that need to raise additional cash for investment opportunities that are value increasing.[8] By allowing surplus cash to find a better use, economy-wide corporate investment is more efficiently allocated.

Share Repurchase Regulation

Prior to 1982, companies conducting open market share repurchases were subject to potential stock price manipulation penalties under Sections 9(a)(2) and 10(b) of the Securities Exchange Act of 1934 (Exchange Act). During this period, firms were effectively forced to rely on ordinary or special dividends to return surplus cash to shareholders. Since ordinary dividends are taxed as ordinary income, it results in the double taxation of corporate income since the distributed cash was generated by earnings that were already taxed at the corporate level.

Under Rule 10b-18, which the SEC adopted in 1982 and updated in 2003, firms can receive a safe harbor from liability for manipulation based solely on the timing or price of repurchases.[9] Importantly, managers can still violate the anti-fraud and anti-manipulation provisions of the Exchange Act if they, for example, engage in repurchases while in possession of material, nonpublic information that could impact the company's stock price. Thus, most share repurchases actively seek this safe harbor by following a standard process.[10]

Share Repurchase Mechanics

Before engaging in buybacks, the board of directors must explicitly authorize and approve a formal share repurchase program. The firm then publicly discloses the repurchase program prior to its

8. It is important to note that the buyback cash paid to shareholders does not necessarily exit capital markets or the economy. Investors that tender their shares during the share repurchase program can reinvest the cash received at other companies or spend it to consume goods and services. Thus, share repurchases can have a reallocation effect by allocating capital to a more efficient use.
9. See SEC, Purchases of Certain Equity Securities by the Issuer and Others, Final Rule, November 10, 2003, available at https://www.sec.gov/rules/final/33-8335.htm.
10. The SEC's Division of Trading and Markets provides a set of questions and answers to assist companies in meeting the voluntary safe harbor from liability for manipulation under Rule 10b-18. See SEC, "Division of Trading and Markets: Answers to frequently asked questions concerning Rule 10b-18 ('Safe Harbor' for Issuer Repurchases)," modified December 2, 2016, available at https://www.sec.gov/divisions/marketreg/r10b18faq0504.htm.

commencement. This disclosure informs market participants on the timing, size, objective, and method of repurchase. Although this disclosure is not a firm commitment to repurchase shares, the market response to repurchase announcements has historically been positive, indicating that investors approve of the board's decision and view the disclosure as a credible non-binding commitment (see, e.g., Ikenberry et al., 1995; Oded, 2005; Bargeron et al., 2011). Over the course of an active repurchase program, firms are required to periodically report the actual shares repurchased on SEC Forms 10-Q and 10-K (and 20-F for foreign private issuers).[11]

There are several methods for repurchasing shares. The most common approach is called an open market repurchase (OMR) program, where the firm buys back its shares over a period that can last several months or multiple years. Academic studies (e.g., Oded, 2005; Farre-Mensa et al., 2014) have shown that OMRs constitute as much as 90% of the dollar volume of all announced repurchases. An advantage of an OMR is that a firm can determine how many shares to repurchase as a function of changing market conditions (Stephens and Weisbach, 1998; Cook et al., 2004).

Companies also employ structural buyback programs with features designed to achieve specific objectives. One example is an accelerated share repurchase (ASR) program. A firm that employs an ASR retains an investment bank to collect a large position in the firm's common stock for which the firm pays a fixed as opposed to uncertain price to repurchase. In effect, an ASR functions much like a reverse equity issuance. In some cases, the cash used to execute an ASR comes from the issuance of new debt, which substantively increases the relative amount of debt in the firm's capital structure. ASR programs, however, are less flexible than OMR programs as managers have less flexibility to alter ASR terms once this type of repurchase program is announced (Bargeron et al., 2011). Other less frequently employed forms of repurchases include privately negotiated repurchases (Peyer and Vermaelen, 2005) and tender offers through a Dutch auction (Comment and Jarrell, 1991) or at a fixed price (Masulis, 1980).

Motivations for Repurchasing Stock

Firms engage in stock buybacks for a number of reasons. As noted above, share repurchases are a mechanism for distributing surplus cash, which is the amount of cash left over after funding new investment opportunities. By returning surplus cash to investors, managers can attenuate the temptation to invest in negative net present value projects (i.e., projects that earn less than the opportunity cost of capital) that sub-optimally grow the size of the firm's assets.

Prior to the SEC's safe harbor for share repurchases, there was considerable evidence that some managers would use surplus cash for projects or acquisitions that increased the size of assets under their control. These actions generated managerial prestige and boosted compensation, thereby destroying firm value (Jensen, 1986).

11. In contrast to quarterly reporting of buyback activity by the firm, its insiders—defined as top executives, directors, and 10% owners—must report buys and sales within two business days after the transaction under Section 16(a) of the Securities Exchange Act of 1934. See SEC, "Exchange Act Section 16 and related rules and forms," modified August 11, 2010, available at https://www.sec.gov/divisions/corpfin/guidance/sec16interp.htm.

Repurchasing shares and paying dividends limits the resources under management control, thereby requiring firms to engage with capital market participants to fund new investment. Such engagement can create value by adding another layer of monitoring on corporate investment decisions. There also is strong evidence that investors negatively view surplus cash left on the balance sheet rather than being returned via payouts. For example, Dittmar and Mahrt-Smith (2007) show that the market value of $1.00 on the balance sheet of a poorly governed firm is worth less than $1.00. Taken together, academic evidence shows that payout surplus cash via dividends and stock buybacks is a way to unlock value.

In comparison to dividends, share repurchases have a number of additional advantages. First, share repurchases can be a more *tax-efficient* method for returning surplus cash. Consider a dividend paid to all investors simultaneously. Tax laws typically treat the dividend as ordinary income and, thus, paying a dividend triggers potential tax obligations for all investors. In the case of a share repurchase, selling shareholders will be subject to capital gains taxes. If the capital gains tax rate is lower than the ordinary income tax rate, these investors will realize a higher after-tax rate of return on their investment. Moreover, only those investors that tender shares trigger tax obligations since shareholders that do not sell defer tax obligations to a future sale date. Yet, non-selling shareholders still benefit from any corresponding increase in the stock price. On net, share repurchases allow shareholders to determine when they are exposed to personal taxes rather than imposing taxes on retail investors.

A second advantage of share repurchases is the *flexibility* for managers to adjust to changes in market conditions under an OMR program. Dividends carry the implied promise that the company will continue to pay the same or an increasing dividend. Indeed, academic evidence shows that dividend initiations are typically met with an increase in the stock price, which is often attributed to signaling confidence that future profitability will remain strong enough to pay additional dividends. For example, Kale et al. (2012) study a sample of firms initiating their first dividend after an IPO and find a 1.7% positive abnormal price response. However, dividend cuts are typically met with a strongly negative market response. For instance, Henry et al. (2017) find an average −6% stock price decline around the announcement of dividend reduction for a sample of firms during 1997 to 2015.

Several studies find a positive market response to the announcement of share repurchases, which is frequently attributed to signaling undervalued stock prices and a reduction in agency costs by reducing surplus cash (e.g., Ikenberry et al., 1995; Oded, 2005; Bargeron et al., 2011). Bargeron et al. (2020) also show that the suspension of a previously announced open market repurchase program is met with a negative stock price response, but the magnitude of the response is smaller than the response associated with dividend cuts. For example, Bargeron et al. (2020) report a −1.35% abnormal return to disclosing repurchase suspensions over 1984 to 2010, which is substantially less negative than the −6% stock price decline to dividend cuts reported in Henry et al. (2017).

Consistent with repurchases being more flexible than dividends, Stephens and Weisbach (1998) find that "quarterly repurchases are positively related to both the expected and surprise components of the firm's quarterly cash flows, suggesting that managers adjust their stock repurchases for unexpected changes in the firm's cash position." They note that such adjustments would not be possible if managers had to pre-commit to specific amounts or timing in repurchases.

Firms also repurchase shares to adjust their capital structure. For firms that grant stock or issue options to employees, share repurchases help offset the dilutive impact of equity compensation. Similarly, a firm that issues stock to fund an acquisition might wish to repurchase those shares over time to achieve a target capital structure. Firms might also repurchase shares as part of a large change in their capital structure, such as the issuance of debt to repurchases shares, which is known as a leveraged buyback. When companies have slowing growth and unused debt capacity, a leveraged buyback allows firms to optimize their capital structure and avail themselves to valuable tax benefits of debt financing. Prior work (e.g., Lei and Zhang, 2016) shows that leveraged buybacks are met with both positive announcement and long-term stock returns, likely due to the dual governance effect of reducing surplus cash and additional monitoring by creditors. Thus, repurchases can be value-enhancing by reducing agency costs of equity.

B. Contemporaneous Debate on Buybacks

Opponents of Stock Buybacks

The popularity of share repurchase programs attracts its share of critics. Some claim that buybacks sacrifice long-term value creation that harms non-investor stakeholders. For example, Lazonick (2014) argues that share repurchases erode employee income gains, harm employment levels, limit corporate investment, and contribute to a wealth gap between investors and other Americans. Lazonick points to a statistic that, over 2003 to 2012, companies in the Standard and Poor's S&P500 index used 54% of earnings to buy back stock and 37% to pay dividends. Lazonick (2014) notes that these high payout rates leave only 9% to invest in the future growth of companies. Similar criticisms were lodged by Lazonick et al. (2020) and echoed by prominent investors such as BlackRock's Chairman and CEO Laurence Fink in a letter to S&P500 CEOs in 2014.[12]

In response to these concerns, U.S. Sens. Chuck Schumer and Bernie Sanders penned an opinion article for the *New York Times* in February 2019.[13] They cite the same 90% payout statistic as Lazonick (2014) and assert that managers overly focus on shareholder value rather than worker productivity or corporate resiliency. These senators argue that share repurchases are bad for U.S. workers and the long-term strength of the economy. Moreover, they claim that share repurchases constrain

12. In a letter to S&P500 CEOs, Fink states, "Too many companies have cut capital expenditures and even increased debt to boost dividends and share buybacks. We certainly believe that returning cash to shareholders should be part of a balanced capital strategy; however, when done for the wrong reasons and at the expense of capital investment, it can jeopardize a company's ability to generate sustainable long-term returns." See "Text of letter sent by Larry Fink, BlackRock's Chairman and CEO, encouraging a focus on long-term growth strategies," *Wall Street Journal*, March 21, 2014, available at https://online.wsj.com/public/resources/documents/blackrockletter.pdf.
13. See Schumer and Sanders, "Limit corporate stock buybacks," *New York Times*, February 3, 2019, available at https://www.nytimes.com/2019/02/03/opinion/chuck-schumer-bernie-sanders.html.

company investment in research and development (R&D) and reduce firms' ability to pay their workers higher wages. In the article, the senators threaten to introduce legislation that would limit share repurchase activity by modifying the corporate tax code. In July 2019, U.S. Sen. Sherrod Brown introduced legislation seeking to curb stock buybacks by repealing the safe harbor under Rule 10b-18 and creating a "worker dividend" equal to $1 for every $1 million invested in stock buybacks, dividend increases, and special dividends.[14] In September 2021, Sens. Brown and Ron Wyden unveiled a bill titled the Stock Buyback Accountability Act that proposes a 2% excise tax on the amount of stock buybacks.[15]

Criticisms of stock buyback activity also surfaced during the onset of the COVID-19 pandemic. For example, in March 2020, then presidential candidate Joe Biden called upon CEOs to commit to forgo stock repurchases for a full year under the pretext that CEOs should focus on their employees and their community.[16] Specific restrictions on stock buybacks and dividends were also included by Congress in the text of the economic stimulus and relief acts in 2020 and 2021 as well as recently proposed legislation focusing on infrastructure investment.[17]

Proponents of Stock Buybacks

Several academics have responded to criticisms of share repurchases by either highlighting logical flaws in the critiques of buybacks or noting overlooked aspects of corporate financial policies that call into question the premise that buybacks are the source of so many negative economic outcomes. We briefly summarize the rebuttal to the criticism of share repurchases below.

Fried and Wang (2018, 2019) argue that the "90% payout statistic" cited by Lazonick (2014) and U.S. Sens. Schumer and Sanders is misleading. They present empirical evidence that public companies recover about 80% of the cash distributed to shareholders by raising new equity. Thus, the net amounts of cash being returned to shareholders is less than half the amount claimed by buyback critics. Fried and Wang (2018, 2019) also argue that when critics cite the payout ratio—shareholder payouts as a percentage of net income—they fail to recognize that net income has already deducted R&D expenditures, which they estimate accounts for 25–30% of net income. They note that "net income at best is a measure of the amount available for capital expenditures (CAPEX) and additional R&D."

14. See Stock Buyback Reform and Worker Dividend Act of 2019, S.2391, 116th Cong. (2019), available at https://www.congress.gov/bill/.116th-congress/senate-bill/2391/text.
15. See "Brown, Wyden unveil major new legislation to tax stock buybacks," September 10, 2021, available at https://www.brown.senate.gov/newsroom/press/release/brown-wyden-tax-stock-buybacks. A copy of the bill is available at https://www.brown.senate.gov/imo/media/doc/stock_buy_back_accountability_act_bill_text.pdf.
16. See tweet by Joe Biden, "I am calling on every CEO in America to publicly commit now to not buying back their company's stock over the course of the next year. As workers face the physical and economic consequences of the coronavirus, our corporate leaders cannot cede responsibility for their employees. Every CEO in America should be focusing on workers, families, and communities—not executive compensation and share prices." March 20, 2020, available at https://twitter.com/JoeBiden/status/1240998489498288129.
17. The Coronavirus Aid, Relief, and Economic Security Act, which provided $2.2 trillion in economic stimulus, was signed into law on March 27, 2020. The legislation provides loans and loan guarantees to businesses with the restriction that, "[U]ntil the date 12 months after the date the loan or loan guarantee is no longer outstanding, the eligible business shall not pay dividends or make other capital distributions with respect to the common stock of the eligible business." See https://www.govinfo.gov/content/pkg/PLAW-116publ136/pdf/PLAW-116publ136.pdf. Similar restrictions were placed on contractors and air carriers in the $900 billion Consolidated Appropriations Act of 2021 (see https://www.govinfo.gov/content/pkg/BILLS-116hr133enr/pdf/BILLS-116hr133enr.pdf) and the $1.9 trillion American Rescue Plan of 2021 (see https://www.congress.gov/117/bills/hr1319/BILLS-117hr1319enr.pdf).

Fried and Wang (2018, 2019) highlight the flaw in viewing stock buybacks and investments as substitutes. Their evidence indicates that firms are able to make all of the investment in CAPEX and R&D that managers deem necessary and repurchase shares out of surplus cash from net income. Thus, buybacks do not shortchange investments in the company and its employees. Similarly, buybacks do not necessarily sacrifice investments in the community because investors in general tend to invest in local companies (see, e.g., Coval and Moskowitz, 1999). Therefore, it stands to reason that funds directed to stock buybacks are more likely to be reinvested locally.

Fried and Wang (2018, 2019) conclude that shareholder payouts are not wasted from an investment or innovation perspective. Moreover, buybacks and dividends do not constrain firms' ability to invest since shareholders supply investment capital by buying newly issued shares. They also argue that limiting repurchases for public companies would make it harder to return surplus capital to investors who can reinvest in young and growing private firms, which contribute substantially to employment growth. Moreover, they argue that buybacks do not meaningfully contribute to income inequality.

Asness at al. (2018) also push back on the notion that share repurchases are harmful. In their study, they characterize the political attacks on share repurchases as "buyback derangement syndrome." They first reject claims by critics that current levels of buyback activities are abnormally high. In their analysis, they demonstrate that, when properly measured, aggregate share repurchase activity is far below historically high levels. Moreover, when netting repurchases against debt issuance, they claim that share repurchases are essentially a "non-event" in terms of changes in capital structure. Asness et al. (2018) also argue that repurchases did not mechanically create earnings growth or stifle aggregate investment activity as critics often claim. They also contend that buybacks were not the primary cause of the stock market strength during the 2010s and that the "myths" of the buyback programs should be discarded.

Edmans (2017, 2020) systematically challenges critics' claims that companies are misappropriating corporate funds towards buybacks by reviewing several academic studies. He first points to empirical evidence showing that firms are not reducing investment at the expense of long-term value creation. In fact, he argues that this viewpoint "puts the cart before the horse" since firms first allocate money to investment based on investment opportunities that generate a return greater than the firms' cost of capital. Any remaining or "surplus" cash is then available to use for buybacks, which is supported by both empirical and survey evidence that repurchases are made out of residual cash flow after investment spending (Brav et al., 2005).

Edmans (2017, 2020) also points to studies showing that stock repurchases tend to occur when firms' growth opportunities are poor (Grullon and Michaely, 2002) or stock prices are low (Dittmar and Fields, 2015). He argues that buybacks do not necessarily weaken companies in the long term. For example, he points to studies showing that firms engaging in buybacks tend to outperform the market (Ikenberrry

et al., 1995). Edmans (2017, 2020) also confronts the premise behind the critique of buybacks that "more investment is better than less investment." He notes that a fundamental principle of finance is that value is created only if the returns from investment are higher than other projects that shareholders could invest in.

Edmans warns that restrictions on repurchases could harm the economy as it would incentivize companies to "empire build" by investing the capital to sub-optimally grow the size of the firm. Limiting or taxing buybacks would also damage the ability to efficiently reallocate money to young, smaller companies that fuel growth and employment (see, e.g., Fried and Wang, 2018). He also notes that repurchases increase the ownership percentages of insiders such as the CEO, which further aligns their stakes with shareholders.

Given that numerous academic studies refute the claims that buybacks are leading to short-termism that deprives public firms of investment capital and harms stakeholders, it is puzzling that the negative buyback rhetoric continues to persist as part of the political dialogue. In other words, how does one reconcile that some politicians continue to seek ways to limit buyback activity by pointing to claims of short-termism that are not backed up by the preponderance of scientific studies?

To shed light on this phenomenon, Roe and Shapira (2020) examine the power of narrative in corporate lawmaking. They note that "short-termism" is a powerful and persistent narrative of a seemingly dichotomous managerial choice of investing for the short versus long term, which is not true. This narrative argues that market forces encourage short-term actions such as buybacks that necessarily sacrifice long-term value creation and ultimately damage the economy. The narrative is powerful due to forces such as its connotation of good versus bad and psychological tendencies such as confirmation bias by those wishing to limit or tax corporate actions. Roe and Shapira (2020) warn that politicians can use the narrative of short-termism to push for limits on company actions that are not justified by the data, which will inevitably result in sub-optimal policymaking.

C. Buybacks, Liquidity, and Volatility

In this subsection, we review academic literature linking elements of buyback activity to stock liquidity or volatility.[18] Existing studies provide mixed evidence as to whether stock buybacks increase or decrease stock liquidity.

Theoretically, there are several reasons why share repurchase activity could impact liquidity. For example, one implication of the seminal theory on payout by Miller and Modigliani (1961) is that trading

18. Other prior work focuses on the liquidity of the company rather than the liquidity of its stock. For example, Stephens and Weisbach (1998) show that quarterly repurchase activity is positively related to the expected and surprise components of cash flows. This finding implies that managers adjust their repurchase activity when they experience unanticipated changes in their cash holdings (i.e., have fewer liquid assets to use for repurchases). Consistent with this notion, Bargeron et al. (2011) note that, in comparison to OMR buyback programs, ASR programs reduce the flexibility of managers to alter buybacks in response to unexpected shocks to cash flow. Moreover, they note that similar arguments apply to changes in stock price or liquidity after the buyback program is announced. The lack of flexibility is likely one reason that firms buy back greater amounts of stock through OMR rather than ASR programs. Manconi et al. (2019) examine buyback activity around the world and show that buybacks create long-term shareholder value, especially in countries with poor stock market liquidity. However, shareholder returns crucially depend on the liquidity of equity markets. They note that average stock liquidity is the only country-level characteristic that is robustly related to long-term abnormal stock returns, indicating that investors might underreact in the near-term to the positive information contained in buyback announcements.

frictions, such as liquidity costs, could impact firms' payout policy decisions. Similar to the role of underwriters in IPOs (see, e.g., Benveniste et al., 1996), share repurchase activity could contribute to price stabilization, thereby increasing liquidity and reducing volatility by allowing existing and large shareholders to sell at the current market price. However, Holden et al. (2014) note that repurchases could negatively impact liquidity by simply reducing the number of shares traded in the market.

Holden et al. (2014) note that repurchases could also influence liquidity indirectly if they alter the behavior of market-makers, who are key suppliers of market liquidity. This influence will depend on whether market-makers perceive repurchase activities as informed trading by corporate insiders. On the one hand, buybacks could reduce liquidity if market-makers demand compensation for transacting against informed insiders. In this case, market-makers could widen the spread to compensate for their opportunity cost of time and invested capital. On the other hand, share repurchases could induce competition amongst market-makers, who supply liquidity, thereby having a positive impact on liquidity.

Empirical evidence on the relation between buybacks and liquidity is mixed as existing studies document positive, negative, and negligible effects on liquidity. Cook et al. (2004) find a positive relation between buybacks and liquidity. They posit that firms can provide liquidity and lower their capital costs through OMR trades during periods of low trading volume or higher selling pressure. For example, they argue that firms can directly impact quoted bid-ask spreads by placing a limit order to buy shares if the price declines to a certain level. Cook et al. (2004) study buyback activity during 1993 and 1994 for a sample of 64 firms that respond to a questionnaire about buyback activities. Using intra-day trading data, they find that repurchases positively influence liquidity by narrowing bid-ask spreads and attenuating the price impact of order imbalances on days when repurchase trades are completed.

More recently, Hillert et al. (2016) also find a positive relation between share repurchases and liquidity using a sample of companies over 2004 to 2010. Using an instrumental variables approach, these authors report that stock buyback intensity reduces bid-ask spreads and other measures of stock illiquidity. Moreover, they find that firms use buybacks to provide price support via contrarian trading strategies, such as increasing buyback intensity when order imbalances and short selling interest is higher, both of which put downward pressure on stock prices. Thus, these studies provide initial evidence suggesting that firms repurchase stock to provide liquidity.

Other studies find a negative relation between buybacks and liquidity. For example, Barclay and Smith (1988) find that bid-ask spreads widened after stock repurchase announcements during 1983 to 1986. They argue that the widening of bid-ask spreads reflects actions by market-makers to increase compensation for transacting against informed company insiders. Consistent with these findings, Brockman and Chung (2001) also find that buyback activity significantly reduces stock liquidity. They study repurchases by companies listed on the Stock Exchange of Hong Kong, which uniquely requires listed firms to disclose all repurchases

by the start of the next business day. Brockman and Chung (2001) find that bid-ask spreads widen on days when share repurchases are executed versus non-repurchase days. They conclude that buyback activities impose a cost in the form of lower liquidity. Similar findings are reported by Ginglinger and Hamon (2007) for a sample of 352 firms listed in France.

Other studies find negligible evidence of share repurchase announcements influencing stock liquidity. For example, Singh et al. (1994) match a sample of 181 OMR announcements over 1984 to 1990 to a control sample of non-repurchasing firms with similar market capitalizations. They present regressions that fail to uncover differences in bid-ask spreads around the announcement date. Wiggins (1994) studies a sample of 195 repurchase announcements over 1988 to 1990 and finds a negligible decline rather than increase in spreads and no evidence of a shift in depths following the announcement of repurchases. Similarly, Miller and McConnell (1995) study 248 repurchase announcements over 1984 to 1988 and find no relation between repurchases and bid-ask spreads. Franz et al. (1995) study 157 buyback announcements over 1983 to 1987 and find a decline in bid-ask spreads after adjusting for dealers' order-processing and inventory-holding costs.

Taken together, existing research is mixed on whether one might expect a positive or negative relation between buyback activity and measures of stock liquidity. Many of the existing studies examine non-U.S.-listed firms or utilize small or older sample periods that predate changes in SEC rules, technology, and the rise of passive indexing and retail investors. Moreover, there is sparse literature on the influence between stock buybacks and volatility. Thus, we revisit the relation between buybacks, liquidity, and volatility for a large cross-section and time series of over 10,000 firms across 17 years. We also use a wide range of measures of liquidity and volatility that we define in the next section.

3. Sample and Research Design

A. Buybacks and Sample Selection

We construct our sample by first downloading all firms in the Center for Research in Security Prices (CRSP)/Compustat merged databases from Wharton Research Data Services over 2004 to 2020. We begin our sample in the first quarter of 2004 because this period coincides with the December 2003 effective data of SEC rules requiring companies to report quarterly share repurchase activity. Thus, Compustat's full coverage of the number of shares repurchased each quarter begins in 2004. After dropping firms with missing values for our measures of stock liquidity, the final sample includes 10,928 unique firms and 340,327 firm-quarters.

Buyback Activity

We construct two measures of buyback activity. First, we create an indicator variable, buyback active (*BB_ACTIVE*), that equals 1 if a firm repurchases any shares during a quarter, and otherwise 0. Thus, *BB_ACTIVE* is meant to proxy for the *extent* of buyback activity during the quarter. Second, we measure the *intensity* of buyback activity by dividing the number of shares repurchased during the quarter by the shares outstanding at the end of the prior quarter, which we label *BB_PCTOUT*. For firms with missing information on buyback activity, we assume they repurchased zero shares during the quarter. In regression estimates, we take the natural log of 1 plus the ratio of shares repurchased to shares outstanding, to normalize this measure.

Buyback Disclosure

We also capture buyback disclosure using data from the S&P Capital IQ–Key Developments (CIQ-KD) database. The CIQ-KD database contains summaries of events and news that could have a material impact on stock prices. We retain all news events related to share repurchases. We then classify news on buyback programs into three categories: announcements, updates, and expansions.

To identify announcements of new buyback programs, we retain all news events with event identification numbers 36 ("Buybacks"), 152 ("Potential Buybacks"), and 232 ("Buyback Transaction Announcements") in the CIQ-KD database. A random sample of these events shows that they tend to correspond to the announcement of a new buyback plan, firms seeking board or shareholder approval of a buyback plan, or board authorization of a new buyback plan. We create a variable, *BB_ANNOUNCE*, that equals 1 for firms with any of these three event types during a calendar-quarter, and otherwise 0.

To detect updates on quarterly share repurchases, we retain event identification number 231 ("Buyback Tranche Update") in the CIQ-KD database. This event reflects disclosures of buyback activity from a previously announced repurchase program. The event type almost always reports the quarter of reporting, the number of shares repurchased, and often the repurchase price or percentage of repurchase program

that is complete. We generate an indicator variable, *BB_UPDATE*, that equals 1 if a firm provides at least one disclosure of this event type during the quarter, and otherwise 0.

We also measure buyback expansions, which are event identification number 230 ("Buyback—Change in Plan Terms") in the CIQ-KD database. We analyze a random sample of these disclosures and find they mostly reflect an extension of time to repurchase shares under an existing program or an increase in the authorized number of shares they can repurchase. We generate the indicator variable, *BB_EXPAND*, that equals 1 if any of these event type disclosures are made during a quarter, and otherwise 0.[19]

B. Measures of Stock Liquidity

The academic literature designates a stock as having higher liquidity if market participants can quickly trade large quantities at a low cost with little price impact (Liu, 2006). Thus, stock liquidity is a function of trading quantity, speed, cost, and price impact. Given that stock liquidity is highly dimensional, prior researchers have employed a number of metrics to capture these properties.

Amihud Illiquidity

Amihud (2002) introduces a measure of stock illiquidity that is among the most widely used measures of trading cost-based liquidity in the academic literature (Le and Gregoriou, 2020). Amihud's (2020) illiquidity (*ILLIQ*) measure is a return-to-volume metric that captures the sensitivity of daily stock price movements per $1 of trading volume. Thus, it captures the price impact of stock trading. It is calculated in Equation (1) as follows:

$$ILLIQ_{it} = \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \frac{|R_{idt}|}{Dvol_{idt}}$$

where *ILLIQ* is the illiquidity ratio of stock *i* in period *t*, D_{it} is the number of trading days in the period *t* for stock *i*, $|R_{idt}|$ is the absolute value of the daily return for stock *i* on day *d* in the period *t*, and $Dvol_{idt}$ is dollar trading volume for stock *i* on day *d* in the period *t*. We average *ILLIQ* over calendar-quarters during our sample period. Higher values of *ILLIQ* indicate that the stock is less liquid because the return to trading volume is higher.

In comparison to other liquidity measures, *ILLIQ* has the advantages that it is both widely available for all stocks with basic trading data and captures the effects of trading volume on stock price movements. Thus, *ILLIQ* reflects transaction costs (Acharya and Pedersen, 2005). Some work criticizes *ILLIQ* by arguing that the volume effect on stock returns is caused by mispricing and not compensation for illiquidity (Lou and Shu, 2017). Others note that *ILLIQ* suffers from a size bias due to the positive correlation between trading volume and market capitalization (Cochrane, 2005). Thus, in the case of two stocks with identical returns, the one with a smaller market capitalization will mechanically have a higher value of *ILLIQ*. Amihud's *ILLIQ* also ignores time-series and cross-sectional variation in trading frequency.

19. The CIQ-KD database also contains event types 234 ("Buyback Transaction Closings") and 233 ("Buyback Transaction Cancellations"), which are present in 3.96% and 0.02% of sample quarters, respectively.

Bid-ask Spread

Another set of liquidity measures reflects the costs associated with executing a stock trade. One of the most popular and strongest transaction costs measures of liquidity utilizes the spread of the bid and ask price for stocks (Fong et al., 2017). Prior work notes that bid-ask spreads reflect three dimensions of trading costs: order processing costs, information asymmetry, and inventory costs (Demsetz, 1968; Stoll, 1978; Ho and Stoll, 1981).

We measure bid-ask spreads as the closing percentage quoted spread (*SPREAD*) introduced by Chung and Zhang (2014). It is estimated using daily closing bid and ask prices and is calculated in Equation (2) as follows:

$$SPREAD_{it} = \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \frac{Closing\ ask_{idt} - Closing\ bid_{idt}}{(Closing\ ask_{idt} - Closing\ bid_{idt})/2}$$

where $SPREAD_{it}$ is the closing percentage quoted spread of stock i in the period of time t, D_{it} is the number of trading days in time t, and $Closing\ ask_{idt}$ and $Closing\ bid_{idt}$ are the closing ask and bid prices of stock i on day d, respectively. Stocks with higher values of *SPREAD* are considered to be less liquid.

Dollar Trading Volume

Trading volume-based measures of liquidity utilize the number of stock transactions to identify whether the security is more or less liquid. We use two standard measures of trading volume: dollar trading volume and stock turnover. Trading volume-based measures are intuitively linked to bid-ask spreads since a stock transaction will execute only when the bid and ask price overlap. Thus, larger bid-ask spreads imply potentially lower trading volume. However, trading volume can also impact bid-ask spreads. Easley and O'Hara (1992) argue that greater trading volume leads to larger spreads due to the information component of the bid-ask spread.

Dollar trading volume (*DVOLUME*) is the value of traded shares between buyers and sellers. Prior work shows that trading volume is a significant determinant of the liquidity component of stock prices (O'Hara, 2003) and impacts the cost of holding stocks for broker-dealers (Stoll, 1978). It is calculated in Equation (3) as:

$$DVOLUME_{it} = \sum_{j=1}^{n} P_{ikt} \times Vol_{ikt}$$

where $DVOLUME_{it}$ is the dollar trading volume of stock i over the period of time t. It is computed as the sum of the dollar value of n transactions of stock i during period t. P_{ikt} and Vol_{ikt} are the price and quantity of stock i for transaction k at the time period t, respectively. Stocks with higher *DVOLUME* are considered to be more liquid. *DVOLUME* is widely used as a proxy for liquidity in the academic literature (e.g., Lee, 1993; Chordia et al., 2001).

Stock Turnover Ratio

Another trading volume-based measure of stock liquidity is the turnover ratio (*TURN*). This measure is calculated as the number of traded shares divided by the number of shares outstanding in Equation (4) as follows:

$$TURN_{it} = \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \frac{Vol_{idt}}{Shrout_{idt}}$$

where $TURN_{it}$ is the turnover ratio of stock *i* during the period of time *t*, D_{it} is the number of trading days, and Vol_{idt} and $Shrout_{idt}$ are the daily number of shares trading and shares outstanding of stock *i*, respectively. Prior work (e.g., Easley and O'Hara, 1992) shows that *TURN* reflects market information from trading and thus impacts stock liquidity. Moreover, since *TURN* accounts for the market capitalization of stocks, it is likely a superior trading volume-based measure of stock liquidity when compared to *DVOLUME*.

Zero Return Days

One drawback of liquidity measures such as *ILLIQ* is that they do not account for days without trading, which likely reflects important dimensions of illiquidity (Le and Gregoriou, 2020). Thus, we compute an additional measure of liquidity based on the number of trading days with zero returns. In Equation (5), we follow Lesmond et al. (1999) by computing the ratio of the number of days with zero return divided by the total number of observable trading days (*ZEROS*):

$$ZEROS_{it} = \frac{Zero\ daily\ returns_{it}}{D_{it}}$$

where $ZEROS_{it}$ is the ratio of the number of days with returns equal to zero for stock *i* during the period of time *t*, $Zero\ daily\ returns_{it}$ is the number of zero return days of stock *i* over time *t*, and D_{it} is the number of available trading days.

Stocks with higher values of *ZEROS* are considered less liquid. This measure is based intuitively on difficulties in trading highly illiquid stocks, higher transaction costs, and periods when investors with private information are less likely to trade (Lesmond et al., 1999; Lesmond, 2005). Prior work confirms that *ZEROS* is a strong proxy for stock liquidity (Goyenko et al., 2009).

C. Measures of Volatility

We compute three proxies of volatility, two of which are historical measures based on realized changes in stock prices using data from CRSP. Stock return volatility (*RETVOL*) is the standard deviation of daily stock returns over the calendar-quarter. We also compute abnormal stock returns by subtracting out the daily returns of the CRSP value-weighted index. We then estimate abnormal stock return volatility (*ARETVOL*) as the standard deviation of abnormal daily returns over the calendar-quarter. Higher values of *RETVOL* and *ARETVOL* indicate greater realized return volatility. We annualize both measures by *multiplying by √252.*

For our third measure, we ascertain implied volatility (*IVOL*) derived from the prices of stock options. These data are obtained from the OptionMetrics Standardized Options database. Following Goyal and Saretto (2009), we average the implied volatilities of the call and put contracts that are closest to at-the-money (ATM) and are one month to maturity (30 days). Higher values of *IVOL* indicate that, over the life of the option, the market expects larger changes in the underlying stock price.

Tests of stock return volatility focus on a subsample of 340,215 firm-quarters. A subsample of 194,222 firm-quarters has data on implied volatility during 2004 to 2020.

4. Main Results

A. Summary Statistics

In Table 1, we present summary statistics. Firms actively repurchase shares in 27.8% of firm-quarters during our sample period. The average firm repurchases 0.3% of shares outstanding each quarter. When conditioning on non-zero repurchase activity, sample firms repurchase an average of 1.1% of shares outstanding each quarter. We discuss time trends in buybacks in the next subsection.

	Mean	Median	Standard Deviation	Firm Quarters
Buyback Activity				
BB_PCTOUT	0.003	0.000	0.020	340,327
BB_PCTOUT (non-zero)	0.011	0.005	0.037	94,776
BB_PCTOUT (log-transformed)	0.003	0.000	0.013	340,327
BB_ACTIVE	0.278	0.000	0.448	340,327
Buyback Disclosure				
BB_ANNOUNCE	0.053	0.000	0.224	340,327
BB_UPDATE	0.267	0.000	0.442	340,327
BB_EXPAND	0.017	0.000	0.129	340,327
Stock Liquidity				
ILLIQ	0.191	0.001	0.955	340,327
SPREAD	0.009	0.002	0.018	340,327
DVOLUME ($ millions)	35.700	3.196	185.135	340,327
DVOLUME (log-transformed)	14.746	14.977	2.706	340,327
TURN	0.659	0.361	9.467	340,327
TURN (log-transformed)	–1.163	–1.019	1.192	340,327
ZERO	0.033	0.016	0.047	340,327
Volatility				
RETVOL	0.499	0.395	0.435	340,219
ARETVOL	0.467	0.362	0.430	340,219
IVOL	0.474	0.408	0.257	194,222
Firm Characteristics				
SIZE	6.637	6.630	2.223	340,327
LEVERAGE	0.227	0.170	0.227	340,327
MTB	1.597	1.082	1.761	340,327
ROA	–0.002	0.010	0.064	340,327
CASH	0.202	0.097	0.241	340,327
DIVIDENDS	0.003	0.000	0.006	340,327
R&D	0.013	0.000	0.031	340,327
FOROPS	0.370	0.000	0.483	340,327
ANALYSTS	4.640	2.000	6.200	340,327
RANALYSTS	0.002	–0.132	1.000	340,327

	Mean	Median	Standard Deviation	Firm Quarters
OPTIONS	0.011	0.001	0.028	340,327
S&P500	0.099	0.000	0.299	340,327
Uncertainty Measures				
HIEXPVOL	0.500	1.000	0.500	187,192
EPU	0.135	0.126	0.063	340,327

Table 1: Summary Statistics

In terms of disclosure, 5.3% of firm-quarters have a new buyback announcement, which includes either plans for the board to vote on a share repurchase program or announcing that the board has approved a new program. We find that 26.7% of firm-quarters include a buyback disclosure update on the number of shares repurchased and the average repurchase price. Approximately 1.7% of firm-quarters include a disclosure to expand the duration or size of the previously announced repurchase program.

Table 1 also provides sample statistics on our key measures of liquidity and volatility. Recall that each of these measures is estimated at the daily level and then averaged across the calendar-quarter. Sample firms have an average daily Amihud illiquidity value of 0.19 and average (median) bid-ask spread of 90 (20) basis points. The average firm has $35.7 million in daily trading volume and its stock turns over 0.66 times each day. The average sample firm has 3.3% of trading days each quarter with zero returns. The standard deviation of daily stock returns is just over 3%, which annualizes to just under 50%. Table 1 shows similar estimates of abnormal stock return volatility and implied volatility, as the average firm has an annualized average of 47% for both measures.

Across firm characteristics, the median firm has 17% debt, a return on assets close to 1%, and approximately 10% of assets in cash. These firms invest an average of 1.3% of assets in quarterly R&D, pay an average of 0.3% of assets in quarterly cash dividends, and have an average (median) market-to-book value of 1.6 (1.1). Approximately 37% of sample firms have foreign operations and the average (median) firm has 4.6 (2) analysts providing quarterly earnings forecasts. Approximately 10% of sample firms are included in the S&P500 index.

B. Time Trends in Buybacks

Full Sample Repurchase Activity

Figure 1 shows the time-series trend for both measures of buyback activity over the full sample period. In this figure, quarterly buyback intensity (*BB_PCTOUT*) is depicted using bars that correspond to the left y-axis. The percentage of firms actively repurchasing shares (*BB_ACTIVE*) is depicted as a line graph whose scale is provided on the right y-axis.

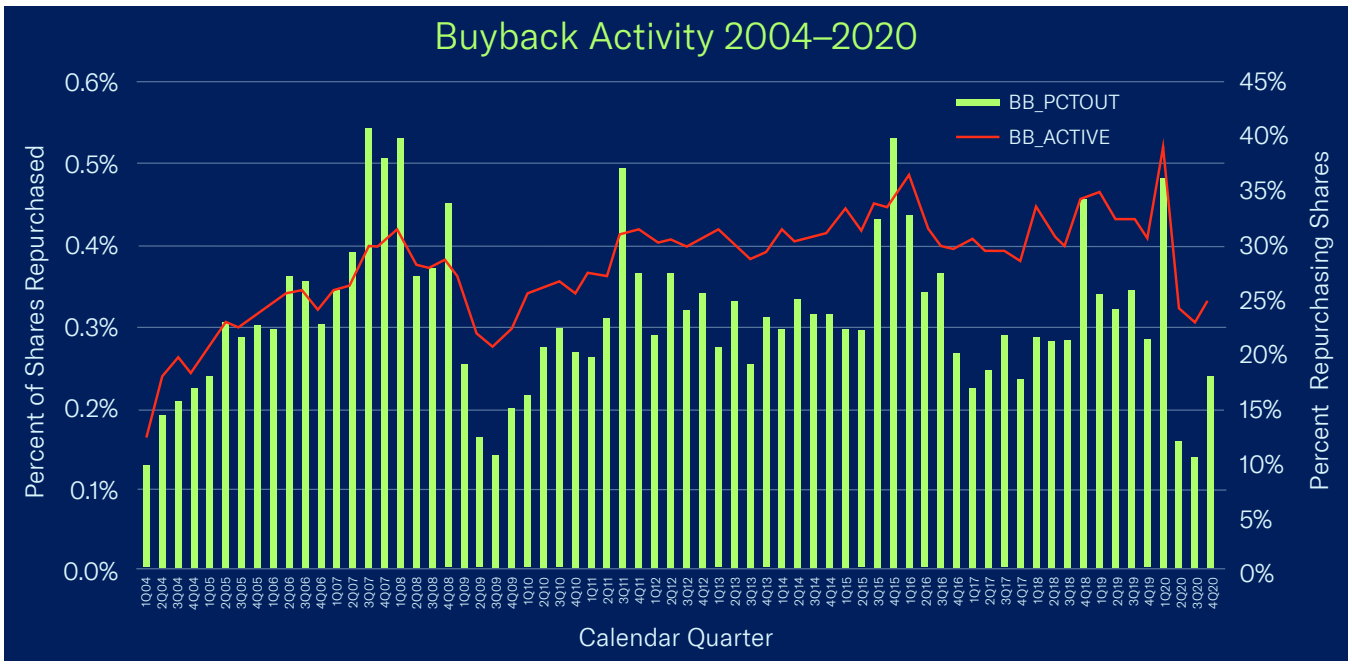


Figure 1: Buybacks over time

The plots show that both measures of buyback activity increase from 2004 to 2007. Buybacks decline during the financial crisis of 2008 and bottom out in 3Q09 before increasing again. These patterns likely correspond to periods when firms have surplus cash that can be returned to investors.

Buyback intensity spikes during 1Q08, 3Q11, 4Q15, 4Q18, and 1Q20, which tend to align with the approximate start of presidential election years. These patterns motivate us to conduct additional analyses of presidential elections in Subsection 5.2.

The presence of buyback activity increases over 1Q04 to a peak of 32% in 1Q08, before falling to 21% in 3Q09. Buyback activity increases again and peaks at 36% in 1Q16, then oscillates before it reaches a high of 39% in 1Q20.

Buyback activity fell precipitously in 2Q20 to 23%, which is a decline of over 40% from the prior quarter, likely due to the onset of the COVID-19 pandemic.

Repurchase Activity by S&P500 Index Membership

Prior academic literature shows that buyback activity varies based on factors such as firm size and profitability (e.g., Bhattacharya and Jacobsen, 2016). Thus, in Figures 2 and 3, we further analyze time-series variation in buyback activity by partitioning our sample based on whether the firm is a member of the S&P500 index. S&P determines the constituents of the S&P500 index, which includes large capitalization stocks.[20]

20. A discussion of the index methodology is provided by S&P in "S&P U.S. indices methodology," June 2021, available at https://www.spglobal.com/spdji/en/documents/methodologies/methodology-sp-us-indices.pdf.

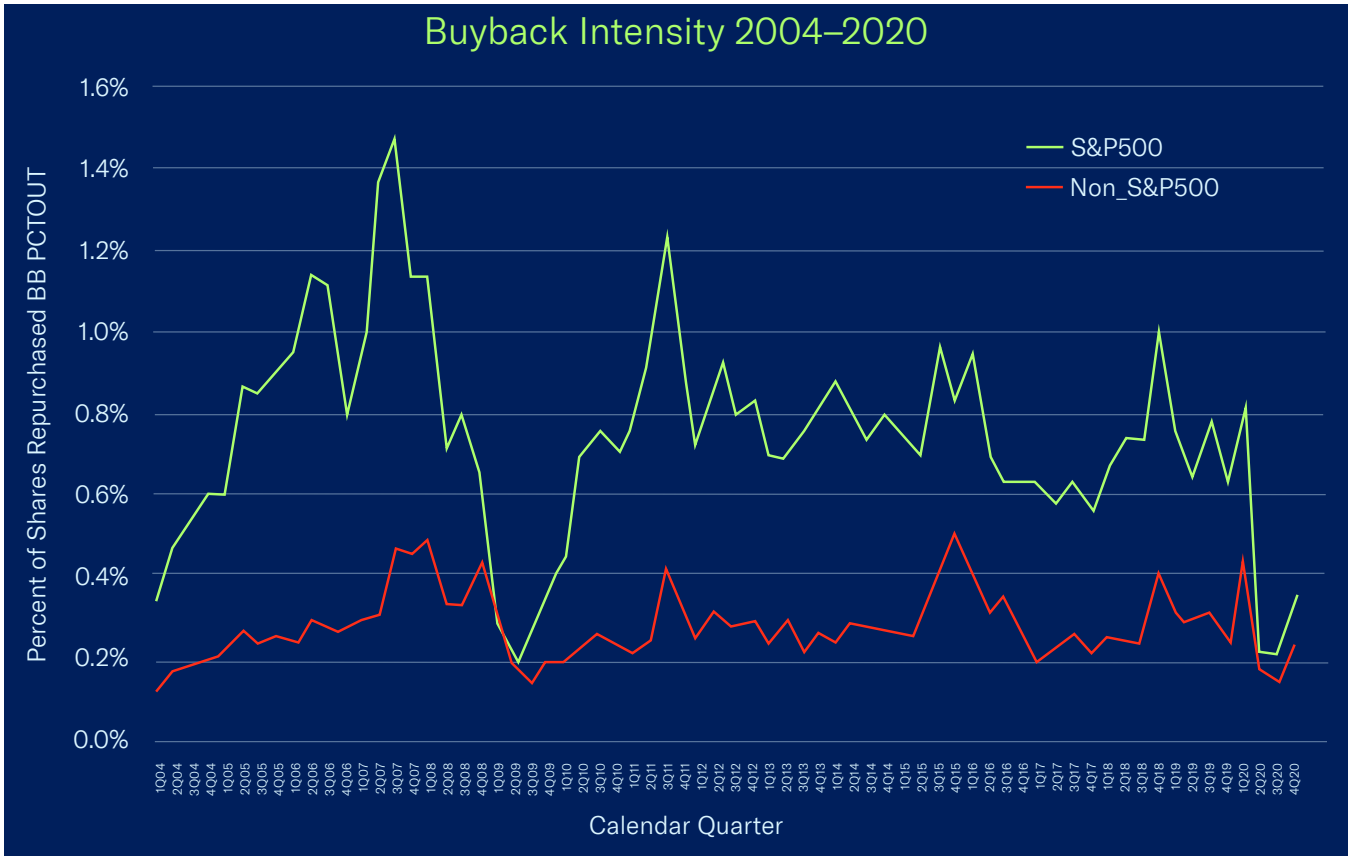


Figure 2: Share buyback intensity for S&P500 and non-S&P500 firms

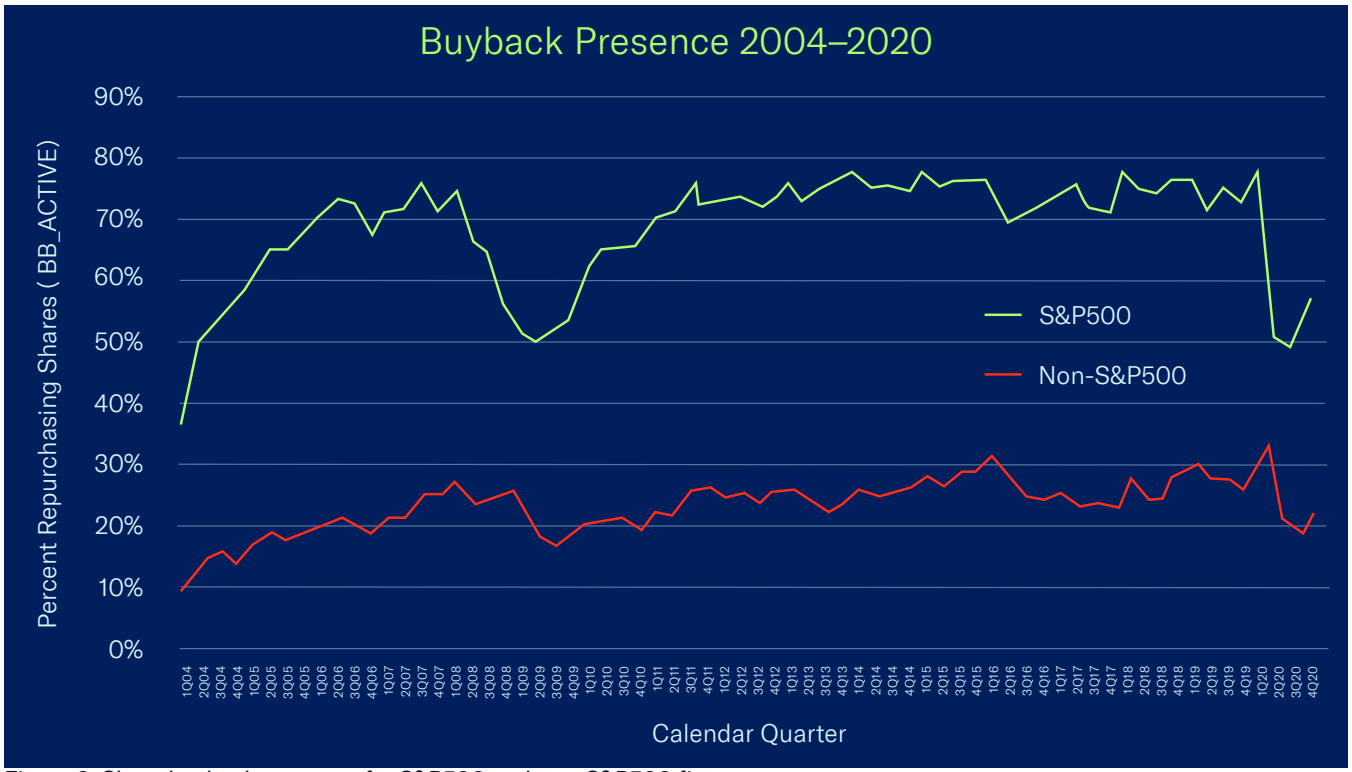


Figure 3: Share buyback presence for S&P500 and non-S&P500 firms

Figure 2 shows that variation in buyback intensity (*BB_PCTOUT*) over time is substantially higher for firms that are members of the S&P500. For example, increases in buyback activity during 2004 to 2007 and 2009 to 2011 are more pronounced for S&P500 members. Similarly, the proportional decline in buyback activity during 2008 to 2009 and in early 2020 are stronger for S&P500 index members.

Figure 3 shows similar trends for the percentage of firms actively repurchasing shares (*BB_ACTIVE*). For the full sample, the average percentage of repurchasing shares is 69% for S&P500 members and 23% for non-S&P500 members. These differences likely reflect substantial differences in variation in surplus cash, as larger and profitable firms, such as members of the S&P500, tend to generate greater amounts of free cash flow. This graph reinforces the notion that younger, smaller firms need cash for investment and R&D and have less surplus cash for buyback investment than older, larger firms that tend to compose the S&P500.

Payouts Over Time

Firms can pay out surplus cash via dividends or stock buybacks. Prior literature points to the flexibility of share repurchases as one of their desirable traits versus dividends (e.g., Brav et al., 2005). In Figure 4, we plot time-series variation in buybacks and dividends as a percentage of net income. Figure 4 shows that stock repurchase exhibits substantially more variation than dividends, especially during periods when profitability are higher (e.g., 2007) or lower (e.g., 2009).

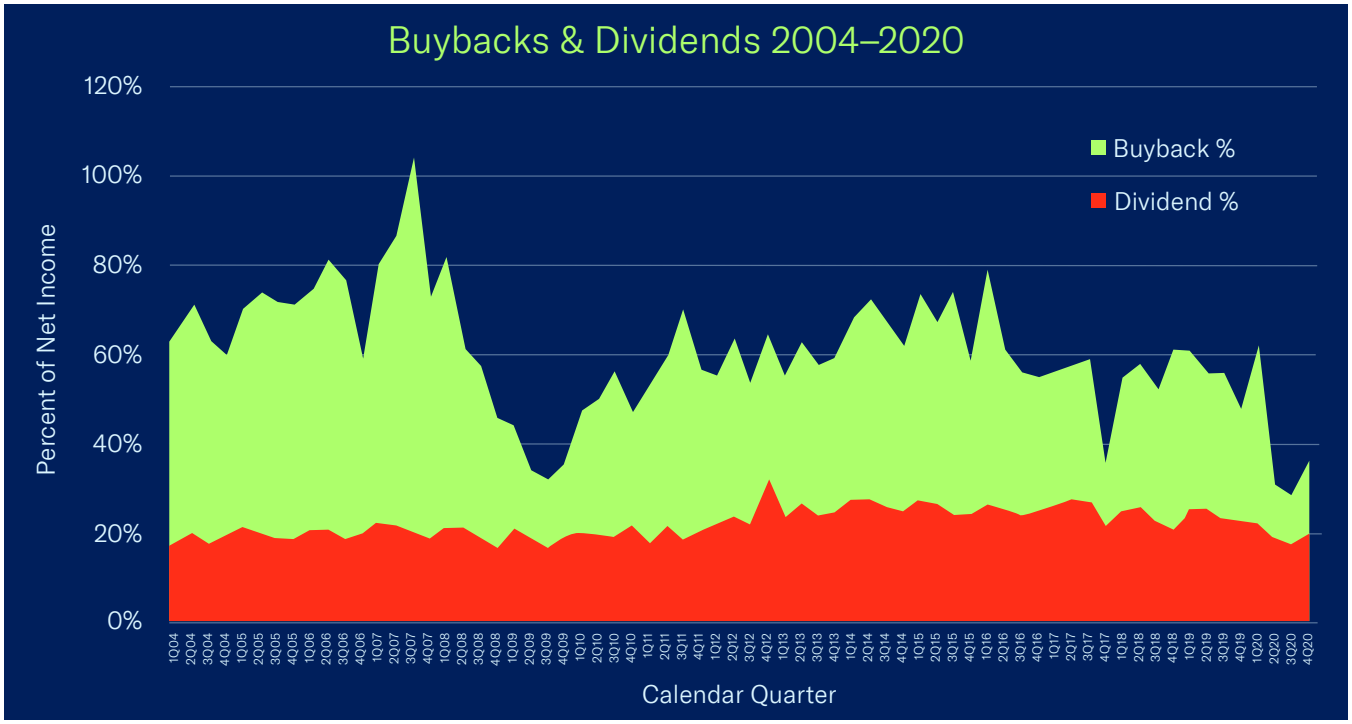


Figure 4: Payouts over time

C. Correlation of Buybacks with Stock Liquidity and Volatility

We present a pairwise correlation matrix of our buyback, liquidity, and volatility measures in Table 2. Columns (1) and (2) provide initial evidence that buyback activity is correlated with lower levels of stock illiquidity and volatility. For example, the presence of buyback activity in a calendar-quarter is correlated with 15.4% lower bid-ask spreads, on average, and a 17% reduction in stock return volatility in Column (2), both of which are statistically different from zero at the 5% level or better. Moreover, Column (3) shows that the measures of liquidity and volatility are highly, but not perfectly, correlated with each other. Thus, each of these measures likely reflects unique dimensions of liquidity and volatility.

	BB_ PCTOUT	*BB_ ACTIVE*	*ILLIQ*	*SPREAD*	*DVOLUME*	*TURN*	*ZERO*	*RETVOL*	*ARETVOL*	*IVOL*
BB_ PCTOUT	1.0000									
BB_ ACTIVE	0.2502*	1.0000								
ILLIQ	–0.0172*	–0.0706*	1.0000							
SPREAD	–0.0360*	–0.1541*	0.6890*	1.0000						
DVOLUME	0.0770*	0.3016*	–0.3876*	-0.6155*	1.0000					
TURN	0.0448*	0.0839*	–0.3320*	-0.4554*	0.6867*	1.0000				
ZERO	–0.0363*	–0.1614*	0.2668*	0.4056*	–0.5408*	–0.3930*	1.0000			
RETVOL	–0.0354*	–0.1660*	0.2303*	0.4257*	–0.2224*	0.1500*	0.0987*	1.0000		
ARETVOL	–0.0400*	–0.1868*	0.2562*	0.4663*	–0.2765*	0.1072*	0.1480*	0.9891*	1.0000	
IVOL	–0.0624*	–0.2577*	0.0509*	0.4900*	–0.4382*	0.2240*	0.2244*	0.7447*	0.7431*	1.0000

Table 2: Correlation Matrix

D. Buybacks and Liquidity

In this subsection, we formally test the relation between buyback activity and stock liquidity by estimating the following equation using ordinary least squares (OLS) regressions in Equation (6):

$$Liquidity_{it} = \alpha + \beta_1 Buyback_{it} + X_{it} + Industry\ FE + Time\ FE + \epsilon_{it}$$

where each of the liquidity *measures* (*ILLIQ, SPREAD, DVOLUME, TURN, ZERO)* of stock *i* during the calendar-quarter *t* are tested separately as the dependent variables. The variable of interest, $Buyback_{it}$, is estimated separately using *BB_PCTOUT* and *BB_ACTIVE*, which allows us to estimate the intensive and extensive margins of stock repurchases on liquidity. We include calendar-quarter fixed effects, which adjust for time trends in liquidity and volatility, and industry fixed effects using two-digit Standard Industrial Classification

(SIC) codes to control for time-invariant industry-level factors.[21] For each regression, we estimate *t*-statistics based on robust standard errors double clustered at the firm and calendar-quarter level.

Based on extant academic research (e.g., Bhattacharya and Jacobsen, 2016), we include a vector of firm controls (X_{it}) that adjust our regression estimates for a wide range of firm characteristics. The Appendix defines these variables, which include standard controls such as firm size (*SIZE*), debt financing (*LEVERAGE*), market-to-book (*MTB*), return on assets (*ROA*), cash holdings (*CASH*), dividend payouts (*DIVIDENDS*), and investments in research and development (*R&D*) based on quarterly data from Compustat. All quarterly control variables are measured in the fiscal period that ends during the same calendar-quarter as the dependent measures of liquidity. However, the relation between buybacks and liquidity is similar if we lag these variables by one fiscal period.

Using annual Compustat data, we generate a foreign operations indicator variable (*FOROPS*) that equals 1 if the firm has a non-missing, non-zero value for pre-tax income from foreign operations in the fiscal year. We also control for analyst coverage (*ANALYSTS*) by counting the number of analysts providing quarterly earnings per share estimates using data from I/B/E/S. For our regressions, we orthogonalize analysts following with respect to firm size since large firms tend to attract more analysts. Thus, the variable residual analyst following (*RANALYSTS*) gauges the portion of analyst coverage not explained by firm size. We control for stock options by taking the natural log of 1 plus the ratio of stock options granted to common shares outstanding in the prior fiscal year (*OPTIONS*). Finally, we use a Python script to obtain information on membership in the Standard & Poor's 500 index (*S&P500*) from the CRSP database.

We report estimates of Equation (6) in Table 3. Panel A uses buyback intensity (*BB_PCTOUT*) as the variable of interest. Across all five measures of liquidity, the coefficient on *BB_PCTOUT* is statistically different from zero at the 1% level and indicates that greater buyback intensity is correlated with better stock liquidity. For example, in tests of *SPREAD* in Column (2), the coefficient on *BB_PCTOUT* is −0.023 with a *t*-statistic of −4.77 (*p*-value<0.001), which indicates that, all else equal, firms buying back a greater portion of their outstanding shares within a calendar-quarter tend to have significantly lower average bid-ask spreads.

21. The relation between buybacks and liquidity are similar if we replace industry fixed effects with firm fixed effects. We utilize industry fixed effects to avoid a reduction in sample size due to singleton observations.

	ILLIQ	*SPREAD*	*DVOLUME*	*TURN*	*ZERO*
Panel A: Intensity of buybacks					
BB_PCTOUT	–0.754***	–0.023***	5.959***	3.185***	–0.035***
	(–3.95)	(–4.77)	(8.99)	(7.44)	(–4.18)
SIZE	–0.160***	–0.005***	1.082***	0.246***	–0.011***
	(–11.60)	(–15.55)	(70.37)	(18.55)	(–26.19)
LEVERAGE	0.176***	0.005***	–0.651***	0.138***	0.014***
	(5.92)	(7.42)	(–11.31)	(3.46)	(10.69)
MTB	–0.050***	–0.001***	0.396***	0.065***	–0.005***
	(–7.98)	(–10.65)	(35.70)	(7.75)	(–20.45)
ROA	–0.319**	–0.025***	0.799***	–1.075***	–0.043***
	(–2.57)	(–8.95)	(2.74)	(–4.26)	(–5.59)
CASH	–0.253***	–0.006***	0.843***	0.709***	–0.005***
	(–6.77)	(–8.12)	(15.01)	(16.19)	(–3.43)
DIVIDENDS	–3.808***	–0.086***	3.198	–13.969***	–0.251***
	(–5.66)	(–6.27)	(1.61)	(–9.57)	(–7.65)
R&D	–1.588***	–0.035***	1.809***	0.297	–0.022*
	(–6.04)	(–7.66)	(4.28)	(0.85)	(–1.99)
FOROPS	–0.031***	–0.001***	0.190***	0.006	–0.003***
	(–2.75)	(–5.17)	(7.32)	(0.30)	(–5.59)
ANALYSTS	–0.001	–0.001***	0.431***	0.161***	–0.003***
	(–0.16)	(–6.79)	(27.77)	(16.44)	(–11.83)
OPTIONS	–0.629***	–0.016***	1.601***	1.458***	–0.035***
	(–3.43)	(–3.42)	(3.20)	(3.33)	(–3.88)
S&P500	0.338***	0.009***	0.141***	–0.330***	0.017***
	(11.73)	(15.31)	(3.30)	(–9.79)	(14.55)
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Quarters	340,323	340,323	340,323	340,323	340,323
Adjusted R^2	0.120	0.320	0.792	0.292	0.277

	ILLIQ	*SPREAD*	*DVOLUME*	*TURN*	*ZERO*
Panel B: Extent of buybacks					
BB_ACTIVE	–0.047***	–0.002***	0.242***	0.009	–0.003***
	(–5.35)	(–9.02)	(13.88)	(0.68)	(–7.59)
SIZE	–0.158***	–0.005***	1.076***	0.247***	–0.011***
	(–11.54)	(–15.47)	(70.06)	(18.51)	(–25.92)
LEVERAGE	0.173***	0.005***	–0.635***	0.139***	0.014***
	(5.84)	(7.33)	(–11.01)	(3.47)	(10.56)
MTB	–0.050***	–0.001***	0.395***	0.064***	–0.005***
	(–7.97)	(–10.64)	(35.74)	(7.67)	(–20.50)
ROA	–0.303**	–0.024***	0.734**	–1.050***	–0.042***
	(–2.43)	(–8.75)	(2.51)	(–4.15)	(–5.43)
CASH	–0.258***	–0.006***	0.870***	0.712***	–0.005***
	(–6.89)	(–8.33)	(15.45)	(16.12)	(–3.62)
DIVIDENDS	–3.660***	–0.081***	2.422	–14.028***	–0.243***
	(–5.43)	(–5.91)	(1.22)	(–9.61)	(–7.40)
R&D	–1.586***	–0.035***	1.806***	0.302	–0.022*
	(–6.04)	(–7.67)	(4.28)	(0.86)	(–1.98)
FOROPS	–0.029**	–0.001***	0.179***	0.008	–0.003***
	(–2.54)	(–4.84)	(6.96)	(0.37)	(–5.33)
ANALYSTS	0.001	–0.001***	0.422***	0.163***	–0.003***
	(0.33)	(–6.19)	(27.49)	(16.59)	(–11.42)
OPTIONS	–0.636***	–0.016***	1.643***	1.463***	–0.035***
	(–3.46)	(–3.45)	(3.24)	(3.33)	(–3.90)
S&P500	0.347***	0.010***	0.100**	–0.323***	0.017***
	(11.91)	(15.63)	(2.36)	(–9.68)	(15.10)
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Quarters	340,323	340,323	340,323	340,323	340,323
Adjusted R^2	0.121	0.321	0.792	0.291	0.278

Table 3: Buybacks and Liquidity

In Panel B, we report regression results where the buyback indicator (*BB_ACTIVE*) is the variable of interest. Across all measures of liquidity except turnover, the presence of buyback activity is statistically related to liquidity improvements in the stock at the 1% level. Moreover, the magnitude of improvements in liquidity is economically meaningful. For example, in tests of *SPREAD* in Column (2), the coefficient on *BB_ACTIVE* is −0.00155 (which is rounded to −0.002 in the table). This 15.5-basis-point reduction is a 17.9% relative decline in bid-ask spreads from the sample mean (0.00867) for firms that are actively repurchasing shares.

Key Takeaway 1: Companies that repurchase shares provide liquidity to the stock market. Greater investment in stock buybacks equates to larger improvements in liquidity. In turn, this liquidity reduces transaction costs for all investors and helps facilitate orderly markets.

E. Buybacks and Volatility

We next test the formal relation between buyback activity and return volatility by estimating Equation (7) using OLS:

$$Volatility_{it} = \alpha + \beta_1 Buyback_{it} + X_{it} + Industry\ FE + Time\ FE + \epsilon_{it}$$

where each of the liquidity *measures* (*RETVOL, ARETVOL, IVOL)* of stock *i* during the calendar-quarter *t* are tested separately as the dependent variables. The variables of interest, fixed effects, standard error clustering, and control variables are all identical to tests of liquidity in Equation (6). The results are reported in Table 4.

	RETVOL	*ARETVOL*	*IVOL*	*RETVOL*	*ARETVOL*	*IVOL*
BB_PCTOUT	−0.632***	−0.626***	−0.658***			
	(−4.89)	(−5.01)	(−6.68)			
BB_ACTIVE				−0.050***	−0.053***	−0.037***
				(−14.21)	(−17.19)	(−14.76)
SIZE	−0.058***	−0.069***	−0.059***	−0.057***	−0.067***	−0.059***
	(−29.87)	(−27.50)	(−32.48)	(−29.55)	(−27.26)	(−32.08)
LEVERAGE	0.206***	0.211***	0.136***	0.203***	0.208***	0.133***
	(11.49)	(11.53)	(13.23)	(11.39)	(11.43)	(12.90)
MTB	−0.008***	−0.011***	−0.017***	−0.008***	−0.011***	−0.017***
	(−4.38)	(−5.33)	(−11.48)	(−4.34)	(−5.30)	(−11.44)
ROA	−1.347***	−1.329***	−1.126***	−1.328***	−1.308***	−1.105***
	(−20.37)	(−21.17)	(−23.04)	(−20.29)	(−21.05)	(−22.57)
CASH	0.036**	0.034**	0.131***	0.030**	0.028**	0.124***
	(2.43)	(2.45)	(12.41)	(2.08)	(2.06)	(11.98)
DIVIDENDS	−5.833***	−5.678***	−4.858***	−5.679***	−5.514***	−4.737***
	(−17.88)	(−17.95)	(−17.41)	(−17.56)	(−17.60)	(−17.00)

	RETVOL	*ARETVOL*	*IVOL*	*RETVOL*	*ARETVOL*	*IVOL*
R&D	−0.754***	−0.789***	0.054	−0.753***	−0.787***	0.050
	(−5.92)	(−6.22)	(0.59)	(−5.93)	(−6.23)	(0.55)
FOROPS	−0.021***	−0.027***	−0.025***	−0.018***	−0.024***	−0.023***
	(−5.89)	(−7.39)	(−7.71)	(−5.18)	(−6.68)	(−7.20)
ANALYSTS	−0.009***	−0.011***	−0.015***	−0.007***	−0.009***	−0.014***
	(−5.15)	(−6.72)	(−10.86)	(−3.97)	(−5.44)	(−10.04)
OPTIONS	0.122***	0.106**	0.332**	0.114**	0.097**	0.324**
	(2.70)	(2.49)	(2.29)	(2.57)	(2.33)	(2.29)
S&P500	0.045***	0.059***	0.023***	0.055***	0.070***	0.030***
	(7.92)	(10.01)	(5.65)	(9.38)	(11.57)	(7.57)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Quarters	340,215	340,215	194,222	340,215	340,215	194,222
Adjusted R^2	0.332	0.322	0.605	0.334	0.324	0.608

Table 4: Buybacks and Volatility

Columns (1) to (3) use buyback intensity (*BB_PCTOUT*) as the variable of interest and (4) to (6) use buyback presence (*BB_ACTIVITY*). Across all six regression estimates, we find strong evidence that stock buybacks are statistically related to lower volatility at the 1% level. For example, the coefficient in Column (4) indicates that firms actively repurchasing their shares have a 5.0 percentage point reduction in return volatility (*RETVOL*) during the quarter, which is significant at the 1% level. When compared to the average quarterly volatility of 0.499, this indicates that the presence of buyback activity is associated with 10% lower stock return variation during the quarter. The results are similar if we use abnormal stock return volatility (*ARETVOL*) that adjusts for total stock market variation or use forward-looking estimates of implied volatility (*IVOL*) for the subsample that has traded stock options.

Key Takeaway 2: Stock buybacks are associated with significant reductions in both realized and anticipated stock return volatility. Thus, bans or limitations on buyback activity would likely result in higher stock market volatility.

F. Buybacks and Investor Savings

Firms that repurchase shares provide liquidity support to investors that want to sell positions. Liquidity support has three separate components: (1) the reduction in actual transaction costs (narrowing the bid-ask spread), (2) the reduction of price impact costs stemming from lower volatility, and (3) the implicit level of price support that a firm provides when it actively attempts to maintain prices at their fundamental values. We provide estimates of the cost savings related to lower transaction and price impact costs. The third benefit is unobservable and does not lend itself to estimation.

Transaction Costs

We first consider how improvements in bid-ask spreads benefit all investors by reducing transaction costs. Recall from Table 2 that in tests of *SPREAD*, the coefficient on *BB_ACTIVE* was −0.00155. This result indicates that firms actively repurchasing shares have a 15.5-basis-point reduction in transaction costs.[22] To quantify the total bid-ask spread savings (*SPREAD SAVINGS*) for investors in our sample, we specify Equation (8) as follows:

$$SPREAD\ SAVINGS_{i,t} = -0.0155 \times SPREAD_{i,t} \times DVOLUME_{i,t} \times BB\_ACTIVE_{i,t}$$

where *SPREAD* is the average closing bid-ask spread for stock *i* in period *t*, which we define in Subsection 3.2.2.; *DVOLUME* is the sum of dollar trading volume of stock *i* over the period of time *t*, which we define in Subsection 3.2.3.; and *BB_ACTIVE* equals 1 for firms repurchasing shares during the quarter. Thus, *SPREAD SAVINGS* represent the transaction cost savings for each stock and quarter in our sample. We scale this value by the number of trading days to calculate the daily average savings in bid-ask spreads and present the results in Panel A of Table 5.

	Full Sample	Buyback Percent Quintiles				
		Q1	Q2	Q3	Q4	Q5
Panel A. Transaction Costs						
Spread Savings						
Average per day ($)	53.7	65.2	40.7	50.5	55.8	56.4
Average per quarter ($)	3,381	4,110	2,554	3,181	3,513	3,548
Total per year ($ millions)	18.8	4.6	2.8	3.5	3.9	4.0
Total all years ($ millions)	320.4	77.9	48.4	60.3	66.6	67.3
Panel A. Transaction Costs						
Price Impact Savings (PIS)						
Average per day ($)	13.09	1.70	7.04	13.16	17.64	25.94
Average per quarter ($)	3,554	3	118	1,458	4,760	11,431
Total per year ($ millions)	1,245	0.2	8.3	102.2	333.5	800.8
Total all years ($ millions)	21,164	3	141	1,737	5,670	13,614

Table 5: Buybacks and Investor Savings

22. One basis point is equivalent to 0.01% or 1/100th of a percent.

The average buyback firm generates $53.7 in savings in bid-ask spreads per trading day. Summing this value for each sample firm across the calendar-quarter shows that the average buyback firm saves investors $3,381 in spreads per quarter. Using the percentage of shares repurchased (*BB_PCTOUT*) each quarter, we sort repurchasing firms into quintiles. We then report the estimates of spread savings for each quintile, which range from $2,554 per quarter for those in the second quintile to $3,548 per quarter for those in the highest quintile. Interestingly, the average firm in the lowest quintile of buyback intensity (Q1) has the largest amount of spread savings at $4,110 per quarter. Across all firms in our sample, spread savings total to $18.8 million per year or $320.4 million for the full sample period.[23]

Price Impact

We next estimate the buyback savings to investors stemming from reductions in the price impact aspect of liquidity. Since price impact typically increases with volatility, firms that provide liquidity during periods when there is net selling pressure will reduce the corresponding price impact associated with investor demand for liquidity.[24] We estimate the price impact savings from buyback-induced reductions in volatility using the so-called "square-root" model (Gomes and Waelbroeck, 2015). According to this model, price impact (*PI*) is a function of the square root of the relative trade size and daily price volatility, which we define in Equation (9) as:

$$PI_{i,t} = 2.8\sigma_{i,t}\sqrt{Q_{i,t} / V_{i,t}}$$

where is the daily stock return volatility for firm *i* on day *t*, is the number of shares of firm *i* repurchased on day *t*, and is average daily trading volume for firm *i* on day *t*. The estimate of the 2.8 scale factor is obtained from Gomes and Waelbroeck (2015).

We then estimate the price impact savings (*PIS*) in Equation (10) as:

$$PIS_{i,t} = 2.8\,\frac{0.05}{\sqrt{252}}\,\sqrt{Q_{i,t} / V_{i,t}} \times BB\_ACTIVE_{i,t}$$

where 0.05 is the coefficient on *BB_ACTIVE* from Table 4, which is the reduction in annualized volatility for firms that repurchase shares in a specific quarter *q*. For estimation purposes, we convert the quarterly number of shares repurchased to a daily estimate by assuming that shares are purchased ratably over the quarter—that is, . is estimated as a rolling average of daily trading volume in stock *i* over the 60 trading days prior to day *t*. equals 1 for firms that are actively repurchasing shares during the quarter, and otherwise 0.

23. An alternative approach to estimating transaction cost savings is to estimate bid-ask spread savings *based on the average daily dollar volume in our sample, which is $74.1 million for firms that are actively repurchasing shares. Multiplying the average daily dollar volume times the savings in bid-ask spread of 15.5 basis points indicates that investors save $74.1 million × 0.00155 = $114,855 per trading day, which multiplied by 62.91 trading days per quarter equates to $7.23 million per quarter on average. Our sample period includes 68 calendar-quarters, indicating the savings in bid-ask spreads totals $491.4 million over 2004 to 2020.*
24. Although a reduction in volatility seems intuitively beneficial, a brief discussion is warranted. In finance, the classical view is that risk—such as volatility—and expected return are positively related as risk-averse investors demand compensation for bearing more risk. For example, the Capital Asset Pricing Model posits that the expected returns of a well-diversified investor's portfolio are positively related to the portfolio's exposure to the risk of the overall market. Thus, one might erroneously conclude that if buybacks reduce volatility, it follows that investors will experience lower returns. This type of logic is flawed because buybacks are designed to reduce temporary volatility spikes associated with price pressure and would not be expected to affect systemic risk.

Next, in Equation (11), we estimate the dollar value of the price impact on day *t* for firm *i* as:

$$DPIS_{i,t} = PIS_{i,t} Q_{i,t} \hat{P}_{i,t}$$

where is the average of the closing prices on days and for firm *i*. The results of Equations (10) and (11) are presented in Panel B of Table 5.

The mean price impact savings per trade is 13.09 basis points. Across the quintiles of percentage of shares repurchased, estimates of price impact range from 1.70 to 25.94 basis points for firms in the lowest and highest quintiles of share repurchase intensity. As one would expect, the price impact benefits associated with the provision of liquidity via buybacks are the highest for firms that are the most active.

The mean dollar price impact savings per trade is $3,554. Estimates of the price impact savings range from $3 to $11,431 for firms in the lowest and highest repurchase intensity quintiles. The aggregate cost savings per year over the full sample is $1,245 million, which totals to $21,165 million of liquidity-induced losses that investors were able to avoid for the full sample period. We note that the estimated price impact savings in this table are losses that investors are able to avoid when companies provide liquidity via repurchases. These savings are not related to losses attributable to changes in the underlying intrinsic value of the firm's stock.

In Figure 5, we graph the aggregate investor benefits from spread savings and price impact across each year in our sample period. As the figure shows, the majority of buyback-induced liquidity savings stem from reductions in price impact. The peak savings in bid-ask spreads occur in 2008 at $55 million, while the peak price impact occurs in 2018 at just over $2 billion.

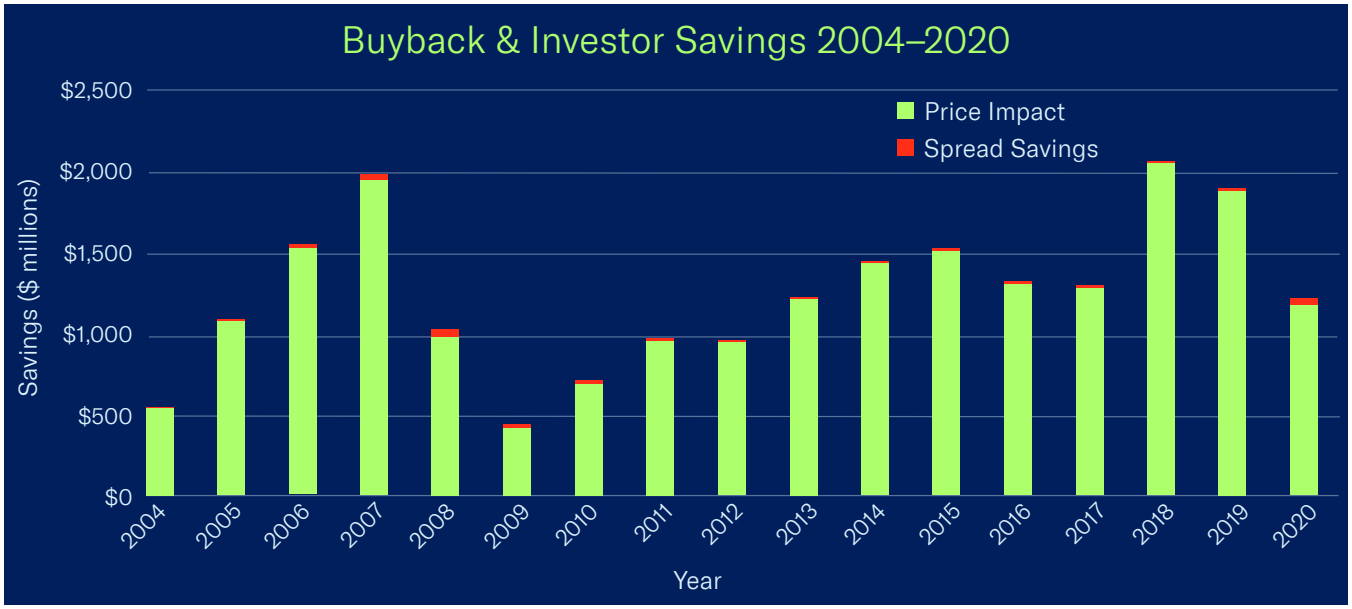


Figure 5: Investor benefits of buybacks

Retail Investors

We next consider how the price impact and transaction cost benefits of share repurchases benefit retail investors. To quantify the benefit for retail investors, we first consider their fraction of market participation. Estimates of retail investor participation range from 10% to 14% of U.S. equity trades before commission-free trading was introduced in 2013, and now represent as much as 23% in 2021.[25]

Table 5 shows that, during our sample period, buybacks generated $320 million in spread savings and $21,164 million in price impact savings for investors. Given that retail investors represent from 10% to 20% of order flow, we estimate that the liquidity provision of buybacks saved retail investors $2.1 to $4.3 billion during our full sample period. These values equate to retail investor savings of $126 to $253 million per year due to buyback activity.

Key Takeaway 3: Stock buybacks generate economically large benefits for retail investors. Since the SEC revised buyback activity disclosures in 2004, we estimate that buybacks have saved retail investors $2.1 to $4.2 billion in transaction and price impact costs.

25. See Katie Martin and Robin Wigglesworth, "Rise of the retail army: the amateur traders transforming markets," *Financial Times*, March 8, 2021, available at https://www.ft.com/content/7a91e3ea-b9ec-4611-9a03-a8dd3b8bddb5; Bloomberg Intelligence, "Stock-market gamification unlikely to end soon or draw new rules," *Bloomberg*, February 19, 2021, available at https://www.bloomberg.com/professional/blog/stock-market-gamification-unlikely-to-end-soon-or-draw-new-rules/; and Bill Hortz and David Aferiat, "Survey on the 2021 State of the Independent Retail Investor," *Nasdaq*, May 25, 2021, available at https://www.nasdaq.com/articles/survey-on-the-2021-state-of-the-independent-retail-investor-2021-05-25.

5. Additional Tests

A. Buybacks and Future Uncertainty

The evidence so far indicates that stock repurchase activity is correlated with reductions in stock illiquidity and volatility. In this subsection, we ask whether market-based measures of future volatility and uncertainty influence the properties of stock buybacks. For these tests, we compute expected volatility (*EXPVOL*) as the ratio of the implied volatility on the 30-day ATM stock options divided by the ***adjusted*** implied volatility on the 91-day ATM stock options on the first day of each calendar-quarter. For this measure, we adjust the implied volatility of the 91-day options to remove the implied volatility component of the 30-day options. We then partition the sample with data in OptionMetrics and create a variable, *HIEXPVOL*, that equals 1 if the firm's expected volatility is above the sample median value for each calendar-quarter; and else 0. We then estimate Equation (12) as follows:

$$Buyback_{it} = \alpha + \beta_1 HIEXPVOL_{it} + X_{it} + Industry\ FE + Time\ FE + \epsilon_{it}$$

where each of the buyback measures (*BB_PCTOUT, BB_ACTIVE, BB_ANNOUNCE, BB_UPDATE, and BB_EXPAND)* of stock *i* during the calendar-quarter *t* are tested separately as the dependent variables. All control variables, fixed effects, and standard error clustering are identical to Equations (6) and (7). Since these regressions include high dimensional fixed effects, we follow the advice of Greene (2004) in using a linear probability model via OLS rather than a *maximum likelihood estimator* to test the dependent indicator variables *BB_ACTIVE, BB_ANNOUNCE, BB_UPDATE, and BB_EXPAND.* If managers strategically use stock repurchases to calm markets during periods of high expected volatility, we anticipate that firms with higher *expected volatility* will be more proactive in repurchasing shares during the quarter in order to attenuate the market's expectation of volatility. Thus, we expect a positive coefficient on β_1.

	BB_PCTOUT	*BB_ACTIVE*	*BB_ANNOUNCE*	*BB_UPDATE*	*BB_EXPAND*
HIEXPVOL	0.002***	0.119***	0.017***	0.121***	0.012***
	(11.18)	(17.47)	(8.55)	(11.73)	(9.28)
SIZE	−0.000	0.006**	0.012***	0.005	−0.000
	(−1.39)	(2.02)	(8.60)	(1.54)	(−0.09)
LEVERAGE	0.001**	−0.046**	−0.035***	−0.098***	−0.008**
	(2.13)	(−2.50)	(−6.12)	(−4.59)	(−2.46)
MTB	−0.000***	−0.007***	−0.001	−0.014***	0.000
	(−8.89)	(−2.98)	(−1.63)	(−5.94)	(0.39)
ROA	0.019***	0.869***	0.256***	1.007***	0.147***
	(12.29)	(12.22)	(10.47)	(12.19)	(6.81)

	BB_PCTOUT	*BB_ACTIVE*	*BB_ANNOUNCE*	*BB_UPDATE*	*BB_EXPAND*
CASH	0.002*	−0.124***	0.022***	−0.106***	0.005
	(1.77)	(−5.88)	(3.61)	(−3.87)	(1.23)
DIVIDENDS	−0.048***	1.281*	−0.212	2.968***	−0.060
	(−4.16)	(1.89)	(−1.09)	(4.30)	(−0.46)
R&D	0.008	−0.029	0.135***	−0.076	0.079*
	(1.62)	(−0.17)	(2.67)	(−0.41)	(1.90)
FOROPS	0.001***	0.064***	−0.001	0.062***	0.002
	(3.99)	(6.83)	(−0.44)	(5.79)	(1.27)
ANALYSTS	0.000***	0.041***	−0.000	0.025***	0.002***
	(7.22)	(10.59)	(−0.28)	(6.58)	(2.93)
OPTIONS	0.001	−0.202**	0.015	−0.347**	−0.008
	(0.54)	(−2.07)	(0.66)	(−2.45)	(−0.59)
S&P500	0.003***	0.237***	0.002	0.135***	0.008***
	(9.30)	(16.85)	(0.35)	(8.09)	(3.26)
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Quarters	186,863	186,863	186,863	186,863	186,863
Adjusted R^2	0.049	0.195	0.024	0.286	0.016

Table 6: Future Uncertainty and Buybacks

The results are reported in Table 6. Columns (1) and (2) indicate that firms with higher expected volatility on the first day of the quarter—where *HIEXPVOL* equals 1—tend to be more active and intensive with their buyback activity during the quarter. For example, the positive coefficient on *HIEXPVOL* in Column (2) is significant at the 1% level and indicates that firms with above-median values of expected volatility are 11.9% more likely to actively repurchase shares.

Column (3) shows that firms with higher expected volatility are also more likely to authorize a new buyback (*BB_ANNOUNCE*). The coefficient of 0.017 on *HIEXPVOL* is 32% of the sample mean of buyback announcements (0.053) and is significantly different from zero at the 1% level (*p-value*<0.001). The results in Columns (4) and (5) indicate that firms with high expected volatility also provide substantially more buyback updates and are more likely to expand the duration or magnitude of the repurchase program.

Overall, the regression estimates in Table 4 imply that managers can potentially influence volatility through their buyback activity. Table 6 extends this result and shows that managers utilize forward-looking estimates of volatility to inform their buyback decisions. The latter result is important as it helps attenuate potential concerns of coefficient bias due to endogeneity via reverse causality. In other words, one might

be concerned that the negative relation between buybacks and volatility shown in Table 4 could be interpreted as either (1) that buybacks reduce volatility or (2) that managers conduct more buybacks when volatility is lower. However, the results in Table 6 show that buyback activity is stronger when forward-looking volatility is higher and not lower as would be the case with reverse causality under interpretation (2). Thus, the evidence indicates that managers use buybacks to reduce volatility.

Key Takeaway 4: Managers attenuate volatility through their buyback activities and utilize market-based estimates of future volatility to inform their buyback decisions. When future volatility is expected to be higher, managers increase their buyback intensity.

B. Buybacks and Policy Uncertainty

To shed more light on the direction of causality between uncertainty and buyback activity, we conduct an additional analysis using exogenous variation in political uncertainty. Prior work links political uncertainty to plausibly exogenous deteriorations in overall market quality and liquidity (Pasquariello and Zafeiridou, 2014; Boone et al., 2021). For these tests, we use the economic policy uncertainty (*EPU*) index developed by Baker et al. (2016), which we obtain from the website policyuncertainty.com. For our analyses, we download the normalized monthly *EPU* index based on the relative volume of news articles discussing terms that reflect policy-related economic uncertainty. We then average these values at the calendar-quarter level and estimate regressions of buyback activity and disclosure as dependent variables.[26]

In particular, we estimate Equation (13) using OLS regressions:

$$Buyback_{it} = \alpha + \beta_1 EPU_t + X_{it} + Firm\ FE + \epsilon_{it}$$

where each of the buyback measures (*BB_PCTOUT, BB_ACTIVE, BB_ANNOUNCE, BB_UPDATE, and BB_EXPAND)* of stock *i* during the calendar-quarter *t* are tested separately as the dependent variables. All control variables are identical to Equations (6) and (7). However, since the variable of interest, EPU, is identical across all firms in a calendar-quarter, we do not include calendar-quarter fixed effects as these would absorb all variation in the EPU index. We also use firm fixed effects (which absorbs industry fixed effects) but the results are similar with either choice. We cluster standard errors at the firm level.

26. To confirm that economic policy uncertainty induces market volatility, we examine the correlation between the EPU index and the CBOE Volatility Index (VIX). We find a 49% correlation between quarterly variation in the EPU index and VIX during 2004 to 2020, which is statistically different from zero at the 1% level.

	BB_PCTOUT	*BB_ACTIVE*	*BB_ANNOUNCE*	*BB_UPDATE*	*BB_EXPAND*
EPU	−0.000	0.114***	−0.073***	1.136***	0.007
	(−0.34)	(5.72)	(−9.95)	(48.38)	(1.63)
SIZE	0.000**	0.059***	0.009***	0.119***	0.006***
	(2.24)	(17.95)	(9.46)	(27.68)	(10.43)
LEVERAGE	−0.001**	−0.062***	−0.046***	−0.041***	−0.011***
	(−2.01)	(−5.35)	(−12.26)	(−2.67)	(−4.23)
MTB	−0.000***	−0.004***	−0.002***	0.002*	0.000
	(−7.04)	(−3.15)	(−5.47)	(1.71)	(0.32)
ROA	0.004**	0.087***	0.091***	−0.276***	0.026***
	(2.30)	(3.19)	(8.89)	(−8.58)	(3.96)
CASH	−0.000	−0.001	0.012***	0.036**	0.005**
	(−0.18)	(−0.06)	(2.97)	(2.23)	(2.01)
DIVIDENDS	0.020***	2.827***	0.489***	6.417***	0.252***
	(2.65)	(9.14)	(3.07)	(15.29)	(2.83)
R&D	0.005*	0.381***	0.071***	0.513***	0.069***
	(1.89)	(6.18)	(3.45)	(6.91)	(4.86)
FOROPS	0.000	0.046***	−0.001	0.103***	0.003*
	(1.23)	(5.85)	(−0.22)	(10.07)	(1.79)
ANALYSTS	0.001***	0.041***	0.008***	0.074***	0.003***
	(6.71)	(10.87)	(5.54)	(15.78)	(3.20)
OPTIONS	0.000	−0.093***	0.012	−0.348***	−0.029***
	(0.32)	(−2.61)	(1.03)	(−3.52)	(−2.84)
S&P500	0.001***	0.075***	0.006	0.070***	0.009***
	(3.20)	(4.86)	(1.11)	(3.54)	(2.96)
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No
Firm Quarters	340,043	340,043	340,043	340,043	340,043
Adjusted R^2	0.097	0.439	0.058	0.467	0.067

Table 7: Political Uncertainty and Buybacks

The regression estimates of Equation (13) are presented in Table 7. In Column (1), the coefficient on *EPU* is not statistically different from zero, indicating that policy uncertainty does not influence the intensity of buyback activity per se. However, Column (2) shows that firms are more likely to repurchase shares during periods when the *EPU* index is higher. Interestingly, the results in Column (3) show that firms are less likely to announce a new buyback program during periods when the *EPU* index

is higher. However, firms are substantially more likely to provide updates on buyback activity during periods of high policy uncertainty (Column 4). Thus, economic policy uncertainty seems to mostly influence *existing* buyback programs by inducing more firms to repurchase shares and provide updates on their repurchase activity during periods of exogenous spikes in uncertainty.

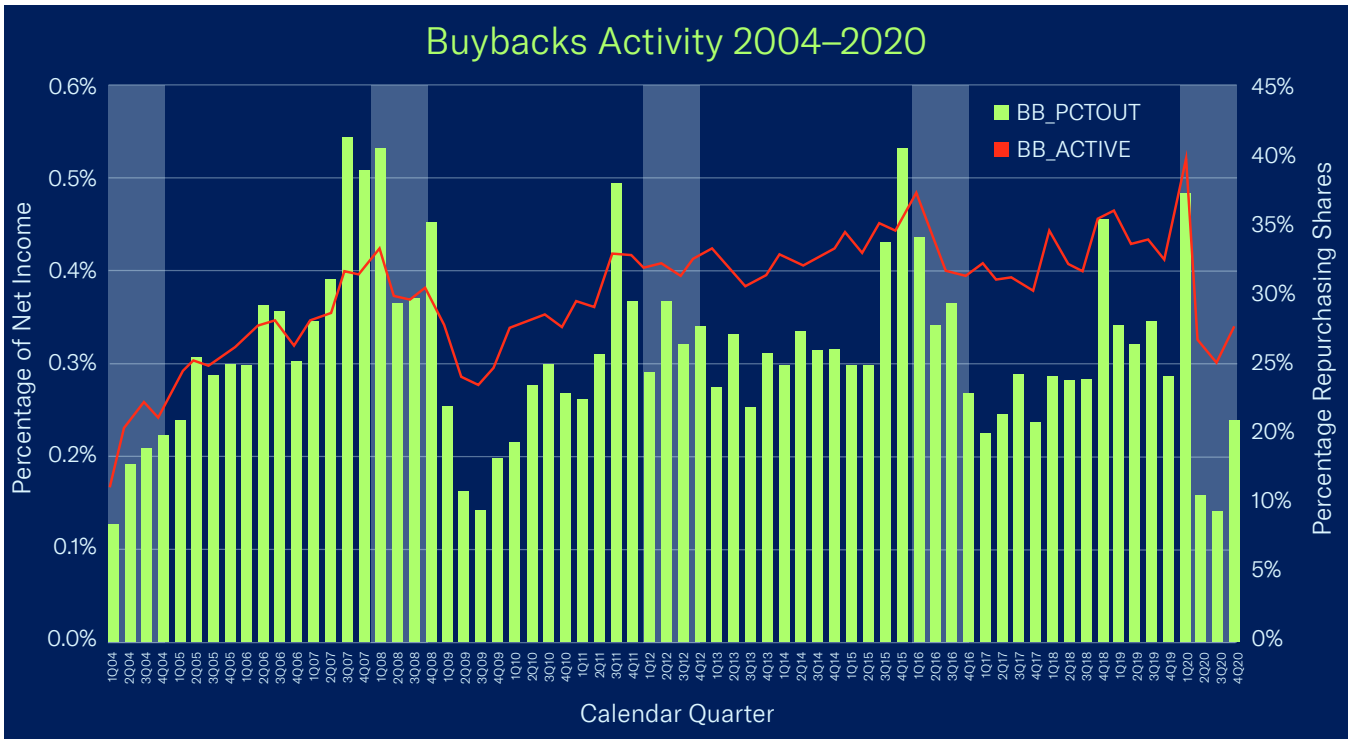


Figure 6: Buybacks and U.S. presidential elections

As an additional measure of how political uncertainty can influence repurchase activity, we again graph buybacks over time in Figure 6. This graph is similar to Figure 1 except we add gray shaded areas that depict U.S. presidential election periods, which we define as starting with the first primary election—the Iowa caucus—in January or February (Q1) and ending with the election in November (Q4).[27] Figure 6 shows that the intensity and presence of buyback activity tend to spike in the one or two quarters just before the presidential election period and persist into the first quarter of the election year, but often return swiftly to the prior level as the election period enters Q2. We observe a similar pattern in 4Q19 except buyback intensity dropped even further in 2Q20, likely due to the COVID-19 pandemic and its impact on business uncertainty and excess cash availability. Thus, this graph provides further evidence that uncertainty and volatility likely factor into firms' buyback decisions.

Key Takeaway 5: Economic policy uncertainty increases stock return volatility and reduces stock liquidity. Managers respond to transient variation in economic policy uncertainty by strengthening their buyback activities. When economic policy uncertainty can be anticipated, such as

27. The Iowa caucus dates during our sample period are January 19, 2004; January 3, 2008; January 3, 2012; February 1, 2016; and February 3, 2020. The U.S. presidential election dates are November 2, 2004; November 4, 2008; November 6, 2012; November 8, 2016; and November 3, 2020.

with presidential elections, managers proactively increase their buyback activities and, in the aggregate, likely have a calming effect on stock markets.

C. Buybacks and Institutional Trading

In this subsection, we examine the relationship between institutional trading and buyback activity. We hypothesize that managers will use buyback activity to provide price support and liquidity to their stock when institutional selling pressure is high, which we refer to as the "liquidity windows hypothesis."

Using data from the Thomson Reuters 13-F database, we measure three properties of institutional ownership. First, we measure the quarterly level of shares owned by institutions with more than $100 million in assets under management. We divide total institutional ownership by shares outstanding and label this variable *IOPCT_OWN*.

We also generate two measures of quarterly flows at the firm level using 13-F data. For each firm, we separately sum institutional buys and sells of stock based on the quarter-over-quarter net change in stock ownership. If an institution reduces its quarterly position, we consider it a "sell." We then calculate the percentage of institutional shares sold divided by total institutional ownership (*IOPCT_SELL*). Similarly, if an institution increases its quarterly position in a stock, we consider it a "buy." The ratio of shares bought during the quarter divided by total institutional ownership is labeled *IOPCT_BUY*. We then estimate buyback activity in Equation (14) using OLS regressions:

$$Buyback_{it} = \alpha + \beta_1 IOPCT\_SELL_{it} + \beta_2 IOPCT\_BUY_{it} + \beta_3 IOPCT\_OWN_{it} + X_{it} + Industry\ FE + Time\ FE + \epsilon_{it}$$

where each of the buyback measures (*BB_PCTOUT, BB_ACTIVE, BB_ANNOUNCE, BB_UPDATE, and BB_EXPAND)* of stock *i* during the calendar-quarter *t* are tested separately as the dependent variables. All control variables, fixed effects, and standard error clustering are identical to Equations (6) and (7). If firms strengthen the presence or intensity of buyback activity to provide liquidity when institutions are more likely to be selling rather than buying shares, then we expect a positive coefficient on β_1 that is larger (i.e., more positive) than the coefficient on β_2. The results are presented in Table 8.

	BB_PCTOUT	*BB_ACTIVE*	*BB_ANNOUNCE*	*BB_UPDATE*	*BB_EXPAND*
IOPCT_SELL	0.067***	3.010***	0.706*	3.701***	0.358
	(3.93)	(5.60)	(1.99)	(9.43)	(1.29)
IOPCT_BUY	0.011	0.761*	−0.103	1.643***	0.018
	(0.66)	(1.67)	(−0.69)	(2.92)	(0.12)
IOPCT_OWN	0.002***	0.164***	−0.005	0.124***	0.009***
	(10.96)	(15.19)	(−1.28)	(7.20)	(5.74)
SIZE	0.000***	0.019***	0.012***	0.016***	0.001***
	(2.74)	(9.71)	(12.13)	(7.11)	(3.40)

	BB_PCTOUT	*BB_ACTIVE*	*BB_ANNOUNCE*	*BB_UPDATE*	*BB_EXPAND*
LEVERAGE	0.000	−0.060***	−0.034***	−0.095***	−0.009***
	(0.43)	(−4.63)	(−9.47)	(−6.17)	(−4.51)
MTB	−0.000***	−0.001	−0.000	−0.004**	0.001
	(−5.18)	(−0.41)	(−0.36)	(−2.20)	(1.55)
ROA	0.008***	0.389***	0.129***	0.476***	0.066***
	(6.89)	(9.80)	(10.51)	(9.27)	(7.05)
CASH	0.001	−0.094***	0.005	−0.097***	0.000
	(1.54)	(−7.39)	(1.46)	(−5.97)	(0.05)
DIVIDENDS	−0.005	3.361***	0.136	5.062***	0.126
	(−0.58)	(6.79)	(0.96)	(8.67)	(1.50)
R&D	0.001	−0.020	0.048*	−0.136	0.025
	(0.22)	(−0.23)	(1.89)	(−1.40)	(1.40)
FOROPS	0.000***	0.049***	0.001	0.051***	0.002*
	(4.57)	(7.32)	(0.80)	(6.35)	(1.71)
ANALYSTS	0.000***	0.029***	0.002**	0.017***	0.002***
	(4.44)	(7.82)	(2.08)	(4.63)	(2.93)
OPTIONS	0.001	−0.176***	0.027*	−0.246***	−0.012*
	(0.66)	(−3.74)	(1.76)	(−3.80)	(−1.71)
S&P500	0.003***	0.261***	0.007	0.147***	0.011***
	(11.17)	(19.46)	(1.61)	(8.79)	(4.59)
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Quarters	340,043	340,043	340,043	340,043	340,043
Adjusted R^2	0.036	0.200	0.024	0.273	0.014

Table 8: Institutional Trading and Buybacks

Column (1) shows that the intensity of buybacks (*BB_PCTOUT*) is stronger when institutions are selling rather than buying shares. Whereas the coefficient on *IOPCT_SELL* is positive (0.067) and statistically significant at the 1% level (*p*-value<0.001), the coefficient on *IOPCT_BUY* is not statistically different from zero (*p*-value=0.511). The results are similar in Column (2), where the dependent variable is the presence of buyback activity (*BB_ACTIVE*). The coefficient on *IOPCT_SELL* (3.010) is statistically different from zero at the 1% level (*p*-value<0.001). The coefficient on *IOPCT_BUY* is smaller (0.761) and is only marginally different from the 10% level (*p*-value=0.100). An *F*-test reveals that the coefficient on *IOPCT_SELL* is statistically larger than the coefficient on *IOPCT_BUY* in Columns (1) and (2).[28]

28. F-tests show that the coefficient on IOPCT_SELL is statistically larger than the coefficient on IOPCT_BUY in Column (1): F-statistic=5.01, p-value=0.029; Column (2): F-statistic=9.15, p-value=0.004; Column (3): F-statistic=4.50, p-value=0.038; and Column (4): F-statistic=10.91, p-value=0.002. The coefficients are not statistically different in Column (5): F-statistic=1.03; p-value=0.313.

Column (3) shows that institutional selling is marginally and positively related to announcements of a buyback plan (*BB_ANNOUNCE*). We find no similar relation with institutional buying. In Column (4), both institutional buying and selling are related to providing buyback updates. However, the coefficient on *IOPCT_SELL* is numerically (3.701 versus 1.643) and statistically (*p*-value=0.002) larger than the coefficient on *IOPCT_BUY*, which we interpret as evidence that managers provide more buyback updates when selling pressure is higher. Neither institutional buying nor selling are related to expansion of buyback programs in Column (5).

Key Takeaway 6: Managers increase stock buyback activity when institutional investors tend to be selling shares, which indicates that buybacks help stabilize markets.

6. Conclusion

We study the liquidity and volatility implications of corporate share buyback programs. Using a broad sample of over 10,000 firms across 17 years, we find strong evidence that firms strategically employ share repurchases to provide an important liquidity role similar to market-makers and a market stabilization role similar to investment bankers. We find strong evidence that share repurchases are associated with overall improvements in stock liquidity and attenuations in stock return volatility. We demonstrate how market improvements from buyback activities specifically benefit retail investors, which we estimate saved retail investors $2.1 to $4.2 billion in transaction and price impact costs during our sample period.

We also find that firms tend to strengthen buyback presence and intensity when institutional investor selling pressure is higher, which is the period when stock liquidity and volatility likely come under pressure. Firms also strengthen buyback activities when the market anticipates higher near-term stock-specific volatility and during spikes in overall economic policy uncertainty.

Taken together, our analyses demonstrate the beneficial impact of share repurchases on stock liquidity and volatility. These relations have important policy implications for contemporaneous discussions on buyback activity. Vocal opponents of stock buybacks have either introduced or threatened to introduce legislation to limit buyback activity. These legislative threats tend to demonize open market repurchase programs, which provide additional flexibility to managers wishing to return surplus capital to investors. Based on our findings, imposing limitations on stock buybacks will limit firms' ability to calm markets, supply liquidity, and reduce volatility during the most crucial periods of uncertainty. Such limitations would ultimately harm retail investors, who now account for approximately 20% of the average daily traded volume of equities in the U.S.

7. References

Acharya, V. V., & Pedersen, L. H. (2005). Asset pricing with liquidity risk. *Journal of Financial Economics*, 77, 375–410.

Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets*, 5, 31–56.

Asness, C., Hazelkorn, T., & Richardson, S. (2018). Buyback derangement syndrome. *Journal of Portfolio Management,* 44(5), 50–57.

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *Quarterly Journal of Economics*, 131(4), 1593–1636.

Barber, B. M., & Odean, T. (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. *Journal of Finance*, 55, 773–806.

Barclay, M. J., & Smith Jr., C. W. (1988). Corporate payout policy: Cash dividends versus open-market repurchases. *Journal of Financial Economics*, 22(1), 61–82.

Bargeron, L., Bonaime, A. A., Feng, M., & Thomas, S. (2020). Voluntary disclosures regarding open market repurchase programs. Available at SSRN: https://ssrn.com/abstract=2486843.

Bargeron, L., Kulchania, M., & Thomas, S. (2011). Accelerated share repurchases. *Journal of Financial Economics*, 101(1), 69–89.

Benveniste, L. M., Busaba, W. Y., & Wilhelm Jr., W. J. (1996). Price stabilization as a bonding mechanism in new equity issues. *Journal of Financial Economics*, 42(2), 223–255.

Bhattacharya, U., & Jacobsen, S. (2016). The share repurchase announcement puzzle: Theory and evidence. *Review of Finance*, 20, 725–758.

Boone, A. L., Kim, A., & White, J. T. (2021). Local policy uncertainty and firm disclosure. Available at SSRN: https://ssrn.com/abstract=3003157.

Brav, A., Graham, J., Harvey, C., & Michaely, R. (2005). Payout policy in the 21st century. *Journal of Financial Economics*, 77, 483–527.

Brockman, P., & Chung, D. Y. (2001). Managerial timing and corporate liquidity: Evidence from actual share repurchases. *Journal of Financial Economics*, 61(3), 417–448.

Chordia, T., Subrahmanyam, A., & Anshuman, V. R. (2001). Trading activity and expected stock returns. *Journal of Financial Economics*, 59, 3–32.

Chung, K., & Zhang, H. (2014). A simple approximation of intraday spreads using daily data. *Journal of Financial Markets*, 17, 94–120.

Cochrane, J. (2005). Asset pricing: Liquidity, trading, and asset prices. *NBER Reporter*, 1, 1–12.

Comment, R., & Jarrell, G. (1991). The relative signaling power of Dutch auction and fixed-price self-tender offers and open-market share repurchases. *Journal of Finance*, 46, 1243–1271.

Cook, D. O., Krigman, L., & Leach, J. C. (2004). On the timing and execution of open market repurchases. *Review of Financial Studies*, 17(2), 463–498.

Coval, J. D., & Moskowitz, T. J. (1999). Home bias at home: Local equity preference in domestic portfolios. *Journal of Finance*, 54(6), 2045–2073.

Demsetz, H. (1968). The cost of transacting. *Quarterly Journal of Economics*, 82(1), 33–53.

Dittmar, A., & Fields, L. (2015). Can managers time the market? Evidence using repurchase price data. *Journal of Financial Economics*, 115, 261–282.

Dittmar, A., & Mahrt-Smith, J. (2007). Corporate governance and the value of cash holdings. *Journal of Financial Economics*, 83(3), 599–634.

Easley, D., & O'Hara, M. (1992). Time and the process of security price adjustment. *Journal of Finance*, 47, 577–605.

Eaton, G. W., Green, T. C., Roseman, B. S., & Wu, Y. (2021). Zero-commission individual investors, high frequency traders, and stock market quality. Available at SSRN: https://ssrn.com/abstract=3776874.

Edmans, A. (2017). The case for stock buybacks. *Harvard Business Review*, September 15, 2017.

Edmans, A. (2020). *Grow the pie: How great companies deliver both purpose and profit.* Cambridge University Press.

Farre-Mensa, J., Michaely, R., & Schmalz, M. (2014). Payout policy. *Annual Review of Financial Economics* (A. Lo and R. Merton, eds.), 6(1), 75–134.

Fong, K., Holden, C., & Trzcinka, C. (2017). What are the best liquidity proxies for global research? *Review of Finance*, 21, 1355–1401.

Franz, D. R., Rao, R. P., & Tripathy, N. (1995). Informed trading risk and bid-ask spread changes around open market stock repurchases in the Nasdaq market. *Journal of Financial Research*, 18(3), 311–327.

Fried, J. M., & Wang, C. C. (2018). Are buybacks really shortchanging investment? *Harvard Business Review*, March-April, 88–95. https://hbr.org/2018/03/are-buybacks-really-shortchanging-investment.

Fried, J. M., & Wang, C. C. (2019). Short-termism and capital flows. *Review of Corporate Finance Studies*, 8(1), 207–233.

Ginglinger, E., & Hamon, J. (2007). Actual share repurchases, timing and liquidity. *Journal of Banking & Finance*, 31(3), 915–938.

Gomes, C., & Waelbroeck, H. (2015). Is market impact a measure of the information value of trades? Market response to liquidity vs. informed metaorders. *Quantitative Finance*, 15(5), 773–793.

Goyal, A., & Saretto, A. (2009). Cross-section of option returns and volatility. *Journal of Financial Economics*, 94(2), 310–326.

Goyenko, R. Y., Holden, C. W., & Trzcinka, C. A. (2009). Do liquidity measures measure liquidity? *Journal of Financial Economics*, 92(2), 153–181.

Greene, W. (2004). The behaviour of the maximum likelihood estimator of limited dependent variable models in the presence of fixed effects. *The Econometrics Journal*, 7(1), 98–119.

Grullon, G., & Michaely, R. (2002). Dividends, share repurchases, and the substitution hypothesis. *Journal of Finance*, 57, 1649–1684.

Henry, D., Nguyen, L., & Pham, V. H. (2017). Institutional trading before dividend reduction announcements. *Journal of Financial Markets*, 36, 40–55.

Hillert, A., Maug, E., & Obernberger, S. (2016). Stock repurchases and liquidity. *Journal of Financial Economics*, 119(1), 186–209.

Ho, T., & Stoll, H. (1981). Optimal dealer pricing under transactions and return uncertainty. *Journal of Financial Economics,* 9, 47–73.

Holden, C. W., Jacobsen, S. E., & Subrahmanyam, A. (2014). The empirical analysis of liquidity. *Foundations and Trends in Finance*, 8(4), 263–365.

Ikenberry, D., Lakonishok, J., & Vermaelen, T. (1995). Market underreaction to open market share repurchases. *Journal of Financial Economics*, 39, 181–208.

Jensen, M. (1986). Agency costs of free cash flow. *American Economic Review*, 76, 323–329.

Kale, J. R., Kini, O., & Payne, J. D. (2012). The dividend initiation decision of newly public firms: Some evidence on signaling with dividends. *Journal of Financial and Quantitative Analysis*, 47(2), 365–396.

Lazonick, W. (2014). Profits without prosperity. *Harvard Business Review*, September, 46–55. https://hbr.org/2014/09/profits-without-prosperity.

Lazonick, W., Sakinç, M. E., & Hopkins, M. (2020). Why stock buybacks are dangerous for the economy. *Harvard Business Review*, January 7, 2020. https://hbr.org/2020/01/why-stock-buybacks-are-dangerous-for-the-economy.

Le, H., & Gregoriou, A. (2020). How do you capture liquidity? A review of the literature on low-frequency stock liquidity. *Journal of Economic Surveys*, 34(5), 1170–1186.

Lee, C. M. C. (1993). Market integration and price execution for NYSE-listed securities. *Journal of Finance*, 48, 1009–1038.

Lei, Z., & Zhang, C. (2016). Leveraged buybacks. *Journal of Corporate Finance*, 39, 242–262.

Lesmond, D. A. (2005). Liquidity of emerging markets. *Journal of Financial Economics*, 77(2), 411–452.

Lesmond, D., Ogden, J., & Trzcinka, C. (1999). A new estimate of transaction costs. *Review of Financial Studies*, 12, 1113–1141.

Lewellen, K. (2006). Risk, reputation, and IPO price support. *Journal of Finance*, 61(2), 613–653.

Liu, W. (2006). A liquidity-augmented capital asset pricing model. *Journal of Financial Economics*, 82, 631–671.

Lou, X., & Shu, T. (2017). Price impact or trading volume: Why is the Amihud (2002) measure priced? *Review of Financial Studies*, 30(12), 4481–4520.

Manconi, A., Peyer, U., & Vermaelen, T. (2019). Are buybacks good for long-term shareholder value? Evidence from buybacks around the world. *Journal of Financial and Quantitative Analysis*, 54(5), 1899–1935.

Masulis, R. W. (1980). Stock repurchase by tender offer: An analysis of the causes of common stock price changes. *Journal of Finance*, 35(2), 305–319.

Miller, J. M., & McConnell, J. J. (1995). Open-market share repurchase programs and bid-ask spreads on the NYSE: Implications for corporate payout policy. *Journal of Financial and Quantitative Analysis*, 30(3), 365–382.

Miller, M. H., & Modigliani, F. (1961). Dividend policy, growth, and the valuation of shares. *Journal of Business*, 34(4), 411–433.

Odean, T. (1999). Do investors trade too much? *American Economic Review*, 89(5), 1279–1298.

Oded, J. (2005). Why do firms announce open-market repurchase programs? *Review of Financial Studies*, 18, 271–300.

O'Hara, M. (2003). Presidential address: liquidity and price discovery. *Journal of Finance*, 58, 1335–1354.

Pasquariello, P., & Zafeiridou, C. (2014). Political uncertainty and financial market quality. Available at SSRN: https://ssrn.com/abstract=2423576.

Peyer, U. C., & Vermaelen, T. (2005). The many facets of privately negotiated stock repurchases. *Journal of Financial Economics*, 75(2), 361–395.

Roe, M. J., & Shapira, R. (2020). The Power of the narrative in corporate lawmaking. Available at SSRN: https://ssrn.com/abstract=3703882.

Singh, A. K., Zaman, M. A., & Krishnamurti, C. (1994). Liquidity changes associated with open market repurchases. *Financial Management*, 23, 47–55.

Stephens, C. P., & Weisbach, M. S. (1998). Actual share reacquisitions in open market repurchase programs. *Journal of Finance,* 53, 313–334.

Stoll, H. R. (1978). The supply of dealer services in securities markets. *Journal of Finance*, 33(4), 1133–1151.

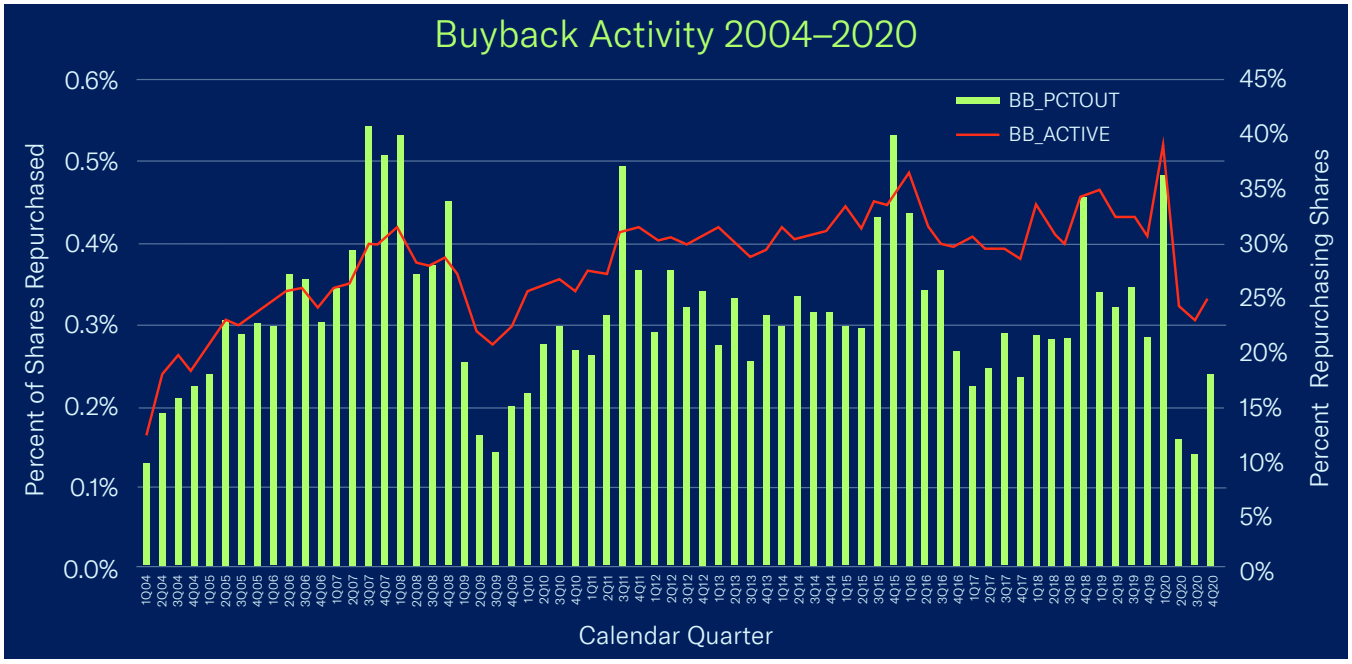
Wiggins, J. B. (1994). Open market stock repurchase programs and liquidity. *Journal of Financial Research*, 17(2), 217–229.

8. Appendix: Variable Definitions

Variable	Definition
Buyback Activity	
BB_PCTOUT	Number of shares repurchased during the quarter by the shares outstanding at the end of the prior quarter.
BB_ACTIVE	Equals 1 if a firm repurchases any shares during a quarter, and otherwise 0.
Buyback Disclosure	
BB_ANNOUNCE	Equals 1 if a firm reports event types 36, 152, or 232 in the CIQ-KD database, which correspond to the announcement of a new buyback program.
BB_UPDATE	Equals 1 if a firm reports event type 231 in the CIQ-KD database, which corresponds to buyback tranche updates of quarterly buyback amounts.
BB_EXPAND	Equals 1 if a firm reports event type 230 in the CIQ-KD database, which corresponds to expanded duration or size of existing buyback programs.
Liquidity	
ILLIQ	Absolute stock return divided by dollar trading volume.
SPREAD	Closing percentage quoted bid-ask spread is the closing ask less the closing bid divided by the midpoint of the closing ask and bid.
DVOLUME	Dollar volume is log transformed value of the stock price times the shares traded.
TURN	Stock turnover is the natural log of shares traded divided by shares outstanding.
ZERO	Percentage of trading days with zero stock returns.
Volatility	
RETVOL	Annualized standard deviation of daily stock returns over the quarter.
ARETVOL	Annualized standard deviation of daily abnormal stock returns over the quarter, where abnormal returns adjust for the returns of the CRSP value-weighted index.
IVOL	Average of the implied volatilities of the call and put contracts, which are closest to ATM and are one month to maturity (30 days).
Controls	
SIZE	Natural log of total assets.
LEVERAGE	Sum of long-term debt and long-term debt in current liabilities divided by total assets.
MTB	Market value of debt and equity divided by total assets.
ROA	Earnings before interest and taxes divided by total assets.
CASH	Cash and cash equivalents divided by total assets.
DIVIDENDS	Common dividends divided by earnings before interest, tax, depreciation, and amortization.
R&D	Research and development expense divided by total assets. Missing values are set to 0.
FOROPS	Foreign operations indicator equals 1 if the firm has a non-missing, non-zero value for pre-tax income from foreign operations during the fiscal year, and otherwise 0.
ANALYSTS	Number of analysts providing quarterly earnings per share estimates from the I/B/E/S adjusted summary file. We set missing values to zero.

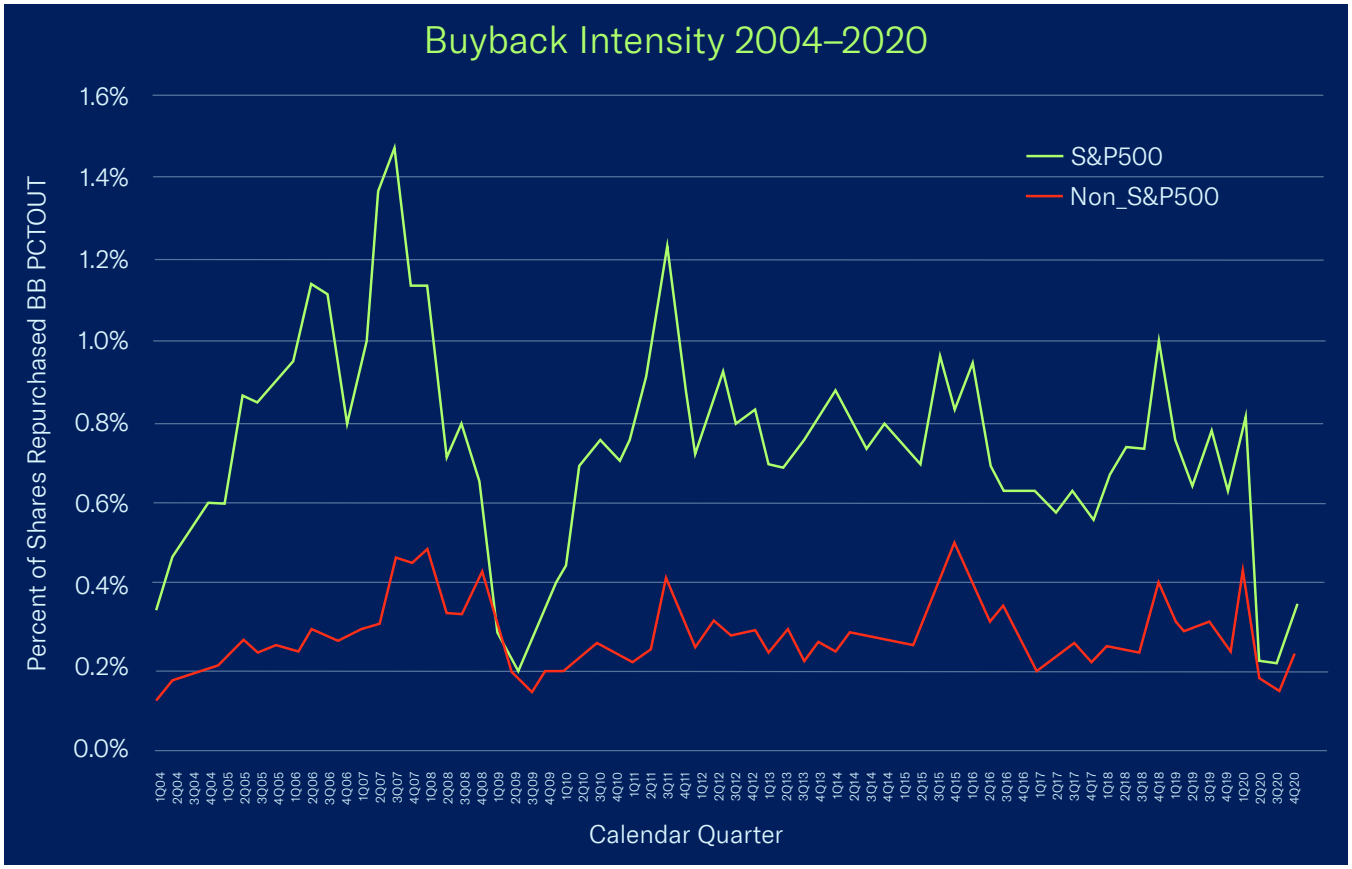
Variable	Definition
RANALYSTS	Residual number of analysts, which is analyst following (ANALYSTS) orthogonalized with respect to firm size (SIZE).
OPTIONS	Natural log of 1 plus the number of options granted divided by shares outstanding in the prior fiscal year.
S&P500	Equals 1 if the company is a member of the S&P500 index, and otherwise 0.
Other Measures	
HIEXPVOL	High expected volatility equals 1 if the firm has an above-median quarterly value of expected volatility, which we define as the ratio of the implied volatility on the 30-day ATM call and put stock option divided by the implied volatility on the 91-day ATM call and put stock options on the first day of each calendar-quarter, and otherwise 0.
EPU	Normalized index value of the volume of news articles discussing economic policy uncertainty from Baker et al. (2016).
IOPCT_SELL	Percentage of institutional shares sold divided by institutional ownership; 0 if missing.
IOPCT_BUY	Percentage of institutional shares bought divided by institutional ownership; 0 if missing.
IOPCT_OWN	Percentage of institutional shares owned divided by total shares outstanding; 0 if missing.

Figure 1. Buybacks Over Time



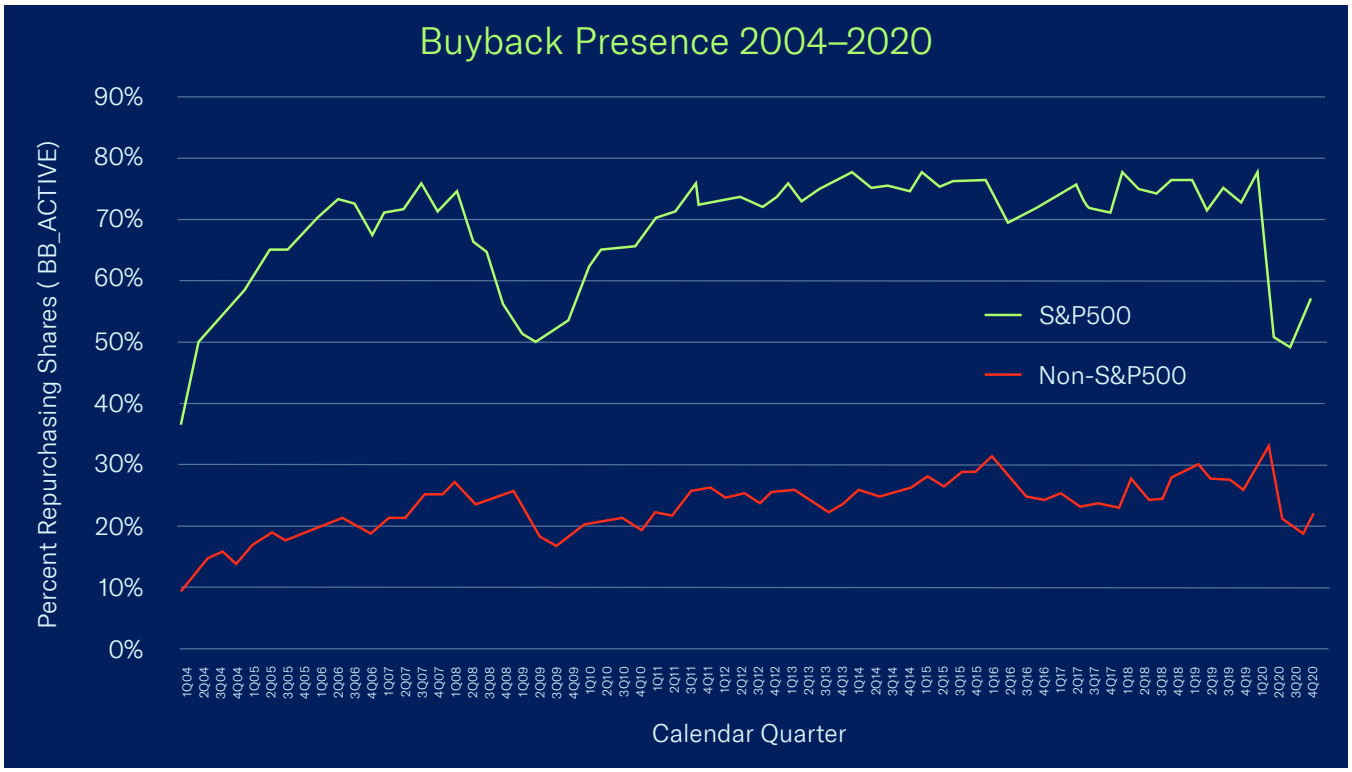
This figure plots time-series variation in buyback activity over calendar-quarters 1Q-04 to 4Q-20. The percentage of shares repurchased (*BB_PCTOUT*) is presented as black bars that correspond to values on the left y-axis. The percentage of firms repurchasing stock (*BB_ACTIVE*) is plotted as a gray dashed line with its scale on the right y-axis.

Figure 2. Share Buyback Intensity for S&P500 and Non-S&P500 Firms



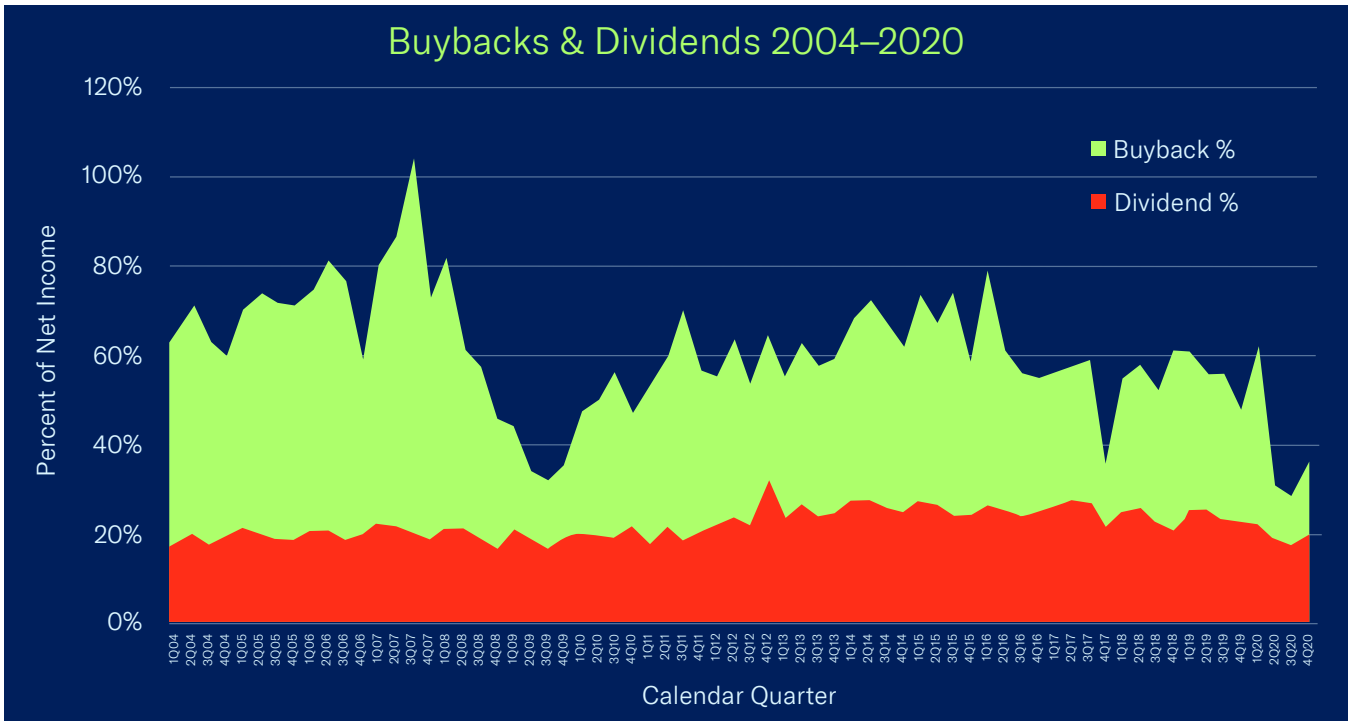
This figure plots time-series variation in buyback intensity based on S&P500 index membership. For each sample quarter, we separately calculate the average percentage of shares repurchased (*BB_PCTOUT*) for sample firms that are members of the S&P500 and those that are not. *BB_PCTOUT* is depicted by the black solid line for S&P500 constituents, and by the gray dashed line for non-S&P500 sample firms.

Figure 3. Share Buyback Presence for S&P500 and Non-S&P500 Firms



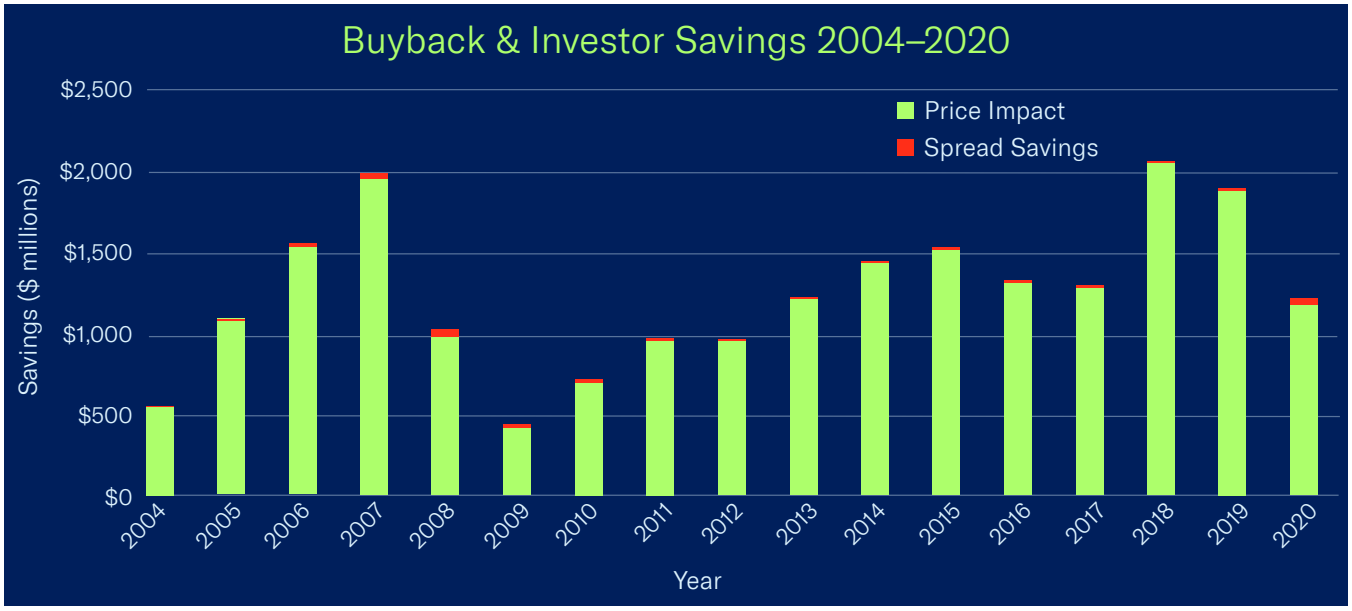
This figure plots time-series variation in buyback activity based on S&P500 index membership. For each sample quarter, we separately calculate the average percentage of firms repurchasing shares (*BB_ACTIVE*) for sample firms that are members of the S&P500 and those that are not. *BB_ACTIVE* is depicted by the black solid line for S&P500 constituents, and by the gray dashed line for non-S&P500 sample firms.

Figure 4. Payouts Over Time



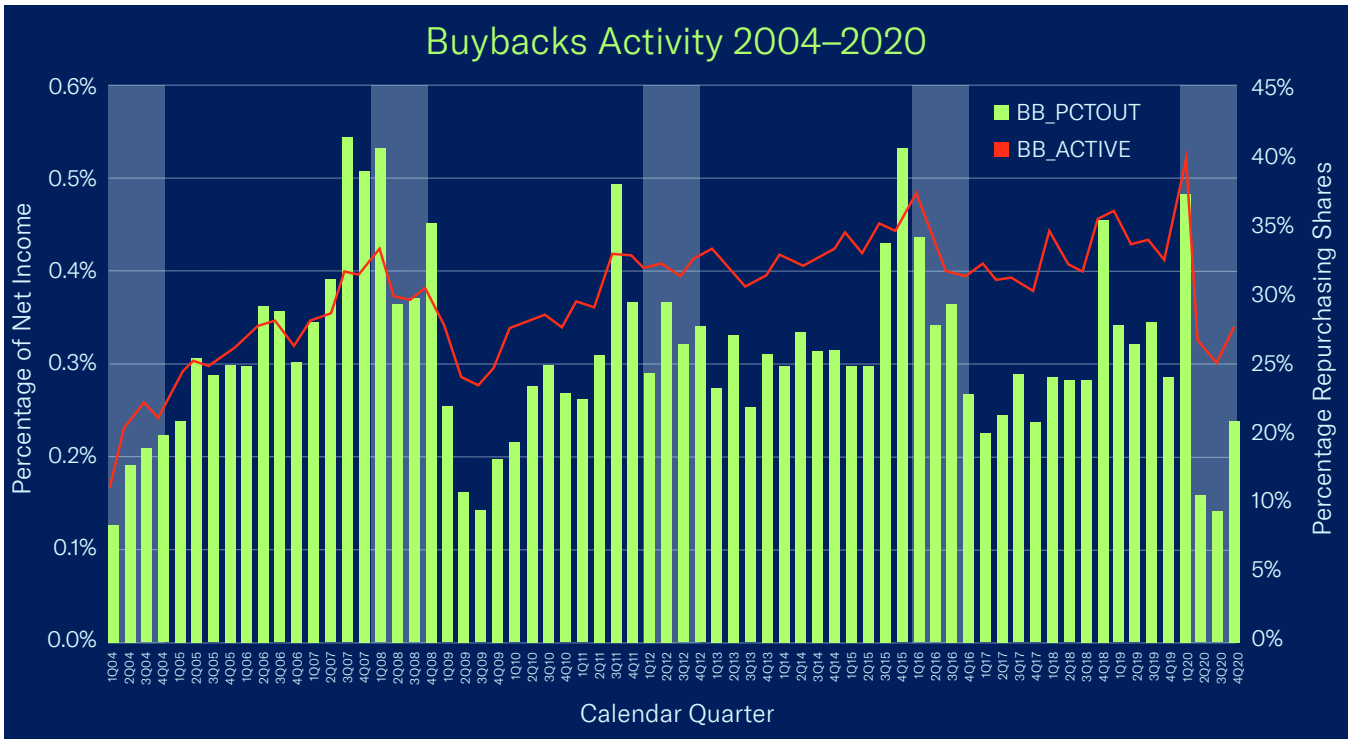
This figure plots time-series variation in payout statistics. For each sample quarter, we separately calculate dividends and buybacks as a percentage of net income. Dividend % is depicted by the area shaded in gray. Buyback % is represented by the area shaded in black.

Figure 5. Investor Benefits of Buybacks



This graph depicts the investor savings from buyback activity over 2004 to 2020. The graphs depict annual savings in terms of transaction costs via bid-ask spreads (*SPREAD SAVINGS*) charted in black bars and price impact savings (*PIS*) charted in gray bars.

Figure 6. Buybacks and U.S. Presidential Elections



This figure plots time-series variation in buyback activity over calendar-quarters 1Q-04 to 4Q-20. The percentage of shares repurchased (*BB_PCTOUT*) is presented as black bars that correspond to values on the left y-axis. The percentage of firms repurchasing stock (*BB_ACTIVE*) is plotted as a gray dashed line with its scale on the right y-axis. The gray shaded areas depict the U.S. presential election period, which begins with the first primary election in Q1 and ends with the election in Q4 during election years.

Table 1. Summary Statistics

	Mean	Median	Standard Deviation	Firm Quarters
Buyback Activity				
BB_PCTOUT	0.003	0.000	0.020	340,327
BB_PCTOUT (non-zero)	0.011	0.005	0.037	94,776
BB_PCTOUT (log-transformed)	0.003	0.000	0.013	340,327
BB_ACTIVE	0.278	0.000	0.448	340,327
Buyback Disclosure				
BB_ANNOUNCE	0.053	0.000	0.224	340,327
BB_UPDATE	0.267	0.000	0.442	340,327
BB_EXPAND	0.017	0.000	0.129	340,327
Stock Liquidity				
ILLIQ	0.191	0.001	0.955	340,327
SPREAD	0.009	0.002	0.018	340,327
DVOLUME ($ millions)	35.700	3.196	185.135	340,327
DVOLUME (log-transformed)	14.746	14.977	2.706	340,327
TURN	0.659	0.361	9.467	340,327
TURN (log-transformed)	–1.163	–1.019	1.192	340,327
ZERO	0.033	0.016	0.047	340,327
Volatility				
RETVOL	0.499	0.395	0.435	340,219
ARETVOL	0.467	0.362	0.430	340,219
IVOL	0.474	0.408	0.257	194,222
Firm Characteristics				
SIZE	6.637	6.630	2.223	340,327
LEVERAGE	0.227	0.170	0.227	340,327
MTB	1.597	1.082	1.761	340,327
ROA	–0.002	0.010	0.064	340,327
CASH	0.202	0.097	0.241	340,327
DIVIDENDS	0.003	0.000	0.006	340,327
R&D	0.013	0.000	0.031	340,327
FOROPS	0.370	0.000	0.483	340,327
ANALYSTS	4.640	2.000	6.200	340,327
RANALYSTS	0.002	–0.132	1.000	340,327
OPTIONS	0.011	0.001	0.028	340,327
S&P500	0.099	0.000	0.299	340,327
Uncertainty Measures				
HIEXPVOL	0.500	1.000	0.500	187,192
EPU	0.135	0.126	0.063	340,327

This table presents the mean, median, standard deviation, and sample observations of key variables. We define variables in the Appendix.

Table 2. Correlation Matrix

	BB_ PCTOUT	BB_ ACTIVE	ILLIQ	SPREAD	DVOLUME	TURN	ZERO	RETVOL	ARETVOL	IVOL
BB_ PCTOUT	1.0000									
BB_ ACTIVE	0.2502*	1.0000								
ILLIQ	–0.0172*	–0.0706*	1.0000							
SPREAD	–0.0360*	–0.1541*	0.6890*	1.0000						
DVOLUME	0.0770*	0.3016*	–0.3876*	-0.6155*	1.0000					
TURN	0.0448*	0.0839*	–0.3320*	-0.4554*	0.6867*	1.0000				
ZERO	–0.0363*	–0.1614*	0.2668*	0.4056*	–0.5408*	–0.3930*	1.0000			
RETVOL	–0.0354*	–0.1660*	0.2303*	0.4257*	–0.2224*	0.1500*	0.0987*	1.0000		
ARETVOL	–0.0400*	–0.1868*	0.2562*	0.4663*	–0.2765*	0.1072*	0.1480*	0.9891*	1.0000	
IVOL	–0.0624*	–0.2577*	0.0509*	0.4900*	–0.4382*	0.2240*	0.2244*	0.7447*	0.7431*	1.0000

This table presents a pairwise correlation matrix at the calendar-quarter level. The asterisk * denotes correlations are statistically different from zero at the 5% level or better. We define variables in the Appendix.

Table 3. Buybacks and Liquidity

	ILLIQ	*SPREAD*	*DVOLUME*	*TURN*	*ZERO*
Panel A: Intensity of buybacks					
BB_PCTOUT	–0.754***	–0.023***	5.959***	3.185***	–0.035***
	(–3.95)	(–4.77)	(8.99)	(7.44)	(–4.18)
SIZE	–0.160***	–0.005***	1.082***	0.246***	–0.011***
	(–11.60)	(–15.55)	(70.37)	(18.55)	(–26.19)
LEVERAGE	0.176***	0.005***	–0.651***	0.138***	0.014***
	(5.92)	(7.42)	(–11.31)	(3.46)	(10.69)
MTB	–0.050***	–0.001***	0.396***	0.065***	–0.005***
	(–7.98)	(–10.65)	(35.70)	(7.75)	(–20.45)
ROA	–0.319**	–0.025***	0.799***	–1.075***	–0.043***
	(–2.57)	(–8.95)	(2.74)	(–4.26)	(–5.59)
CASH	–0.253***	–0.006***	0.843***	0.709***	–0.005***
	(–6.77)	(–8.12)	(15.01)	(16.19)	(–3.43)
DIVIDENDS	–3.808***	–0.086***	3.198	–13.969***	–0.251***
	(–5.66)	(–6.27)	(1.61)	(–9.57)	(–7.65)
R&D	–1.588***	–0.035***	1.809***	0.297	–0.022*
	(–6.04)	(–7.66)	(4.28)	(0.85)	(–1.99)
FOROPS	–0.031***	–0.001***	0.190***	0.006	–0.003***
	(–2.75)	(–5.17)	(7.32)	(0.30)	(–5.59)
ANALYSTS	–0.001	–0.001***	0.431***	0.161***	–0.003***
	(–0.16)	(–6.79)	(27.77)	(16.44)	(–11.83)
OPTIONS	–0.629***	–0.016***	1.601***	1.458***	–0.035***
	(–3.43)	(–3.42)	(3.20)	(3.33)	(–3.88)
S&P500	0.338***	0.009***	0.141***	–0.330***	0.017***
	(11.73)	(15.31)	(3.30)	(–9.79)	(14.55)
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Quarters	340,323	340,323	340,323	340,323	340,323
Adjusted R^2	0.120	0.320	0.792	0.292	0.277

	ILLIQ	*SPREAD*	*DVOLUME*	*TURN*	*ZERO*
			Panel B: Extent of buybacks		
BB_ACTIVE	–0.047***	–0.002***	0.242***	0.009	–0.003***
	(–5.35)	(–9.02)	(13.88)	(0.68)	(–7.59)
SIZE	–0.158***	–0.005***	1.076***	0.247***	–0.011***
	(–11.54)	(–15.47)	(70.06)	(18.51)	(–25.92)
LEVERAGE	0.173***	0.005***	–0.635***	0.139***	0.014***
	(5.84)	(7.33)	(–11.01)	(3.47)	(10.56)
MTB	–0.050***	–0.001***	0.395***	0.064***	–0.005***
	(–7.97)	(–10.64)	(35.74)	(7.67)	(–20.50)
ROA	–0.303**	–0.024***	0.734**	–1.050***	–0.042***
	(–2.43)	(–8.75)	(2.51)	(–4.15)	(–5.43)
CASH	–0.258***	–0.006***	0.870***	0.712***	–0.005***
	(–6.89)	(–8.33)	(15.45)	(16.12)	(–3.62)
DIVIDENDS	–3.660***	–0.081***	2.422	–14.028***	–0.243***
	(–5.43)	(–5.91)	(1.22)	(–9.61)	(–7.40)
R&D	–1.586***	–0.035***	1.806***	0.302	–0.022*
	(–6.04)	(–7.67)	(4.28)	(0.86)	(–1.98)
FOROPS	–0.029**	–0.001***	0.179***	0.008	–0.003***
	(–2.54)	(–4.84)	(6.96)	(0.37)	(–5.33)
ANALYSTS	0.001	–0.001***	0.422***	0.163***	–0.003***
	(0.33)	(–6.19)	(27.49)	(16.59)	(–11.42)
OPTIONS	–0.636***	–0.016***	1.643***	1.463***	–0.035***
	(–3.46)	(–3.45)	(3.24)	(3.33)	(–3.90)
S&P500	0.347***	0.010***	0.100**	–0.323***	0.017***
	(11.91)	(15.63)	(2.36)	(–9.68)	(15.10)
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Quarters	340,323	340,323	340,323	340,323	340,323
Adjusted R^2	0.121	0.321	0.792	0.291	0.278

This table presents results from an OLS regression estimate of stock liquidity and buybacks. All regressions include industry (two-digit SIC) and time (calendar-quarter) fixed effects. *T*-statistics are presented in parentheses based on robust standard errors double clustered at the firm and calendar-quarter levels. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. We define variables in the Appendix.

Table 4. Buybacks and Volatility

	RETVOL	*ARETVOL*	*IVOL*	*RETVOL*	*ARETVOL*	*IVOL*
BB_PCTOUT	−0.632***	−0.626***	−0.658***			
	(−4.89)	(−5.01)	(−6.68)			
BB_ACTIVE				−0.050***	−0.053***	−0.037***
				(−14.21)	(−17.19)	(−14.76)
SIZE	−0.058***	−0.069***	−0.059***	−0.057***	−0.067***	−0.059***
	(−29.87)	(−27.50)	(−32.48)	(−29.55)	(−27.26)	(−32.08)
LEVERAGE	0.206***	0.211***	0.136***	0.203***	0.208***	0.133***
	(11.49)	(11.53)	(13.23)	(11.39)	(11.43)	(12.90)
MTB	−0.008***	−0.011***	−0.017***	−0.008***	−0.011***	−0.017***
	(−4.38)	(−5.33)	(−11.48)	(−4.34)	(−5.30)	(−11.44)
ROA	−1.347***	−1.329***	−1.126***	−1.328***	−1.308***	−1.105***
	(−20.37)	(−21.17)	(−23.04)	(−20.29)	(−21.05)	(−22.57)
CASH	0.036**	0.034**	0.131***	0.030**	0.028**	0.124***
	(2.43)	(2.45)	(12.41)	(2.08)	(2.06)	(11.98)
DIVIDENDS	−5.833***	−5.678***	−4.858***	−5.679***	−5.514***	−4.737***
	(−17.88)	(−17.95)	(−17.41)	(−17.56)	(−17.60)	(−17.00)
R&D	−0.754***	−0.789***	0.054	−0.753***	−0.787***	0.050
	(−5.92)	(−6.22)	(0.59)	(−5.93)	(−6.23)	(0.55)
FOROPS	−0.021***	−0.027***	−0.025***	−0.018***	−0.024***	−0.023***
	(−5.89)	(−7.39)	(−7.71)	(−5.18)	(−6.68)	(−7.20)
ANALYSTS	−0.009***	−0.011***	−0.015***	−0.007***	−0.009***	−0.014***
	(−5.15)	(−6.72)	(−10.86)	(−3.97)	(−5.44)	(−10.04)
OPTIONS	0.122***	0.106**	0.332**	0.114**	0.097**	0.324**
	(2.70)	(2.49)	(2.29)	(2.57)	(2.33)	(2.29)
S&P500	0.045***	0.059***	0.023***	0.055***	0.070***	0.030***
	(7.92)	(10.01)	(5.65)	(9.38)	(11.57)	(7.57)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Quarters	340,215	340,215	194,222	340,215	340,215	194,222
Adjusted R^2	0.332	0.322	0.605	0.334	0.324	0.608

This table presents results from an OLS regression estimate of stock and option volatility. All regressions include industry (two-digit SIC) and time (calendar-quarter) fixed effects. *t*-statistics are presented in parentheses based on robust standard errors double clustered at the firm and calendar-quarter levels. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. We define variables in the Appendix.

Table 5. Buybacks and Investor Savings

	Full Sample	Buyback Percent Quintiles				
		Q1	Q2	Q3	Q4	Q5
Panel A. Transaction Costs						
Spread Savings						
Average per day ($)	53.7	65.2	40.7	50.5	55.8	56.4
Average per quarter ($)	3,381	4,110	2,554	3,181	3,513	3,548
Total per year ($ millions)	18.8	4.6	2.8	3.5	3.9	4.0
Total all years ($ millions)	320.4	77.9	48.4	60.3	66.6	67.3
Panel A. Transaction Costs						
Price Impact Savings (PIS)						
Average per day ($)	13.09	1.70	7.04	13.16	17.64	25.94
Average per quarter ($)	3,554	3	118	1,458	4,760	11,431
Total per year ($ millions)	1,245	0.2	8.3	102.2	333.5	800.8
Total all years ($ millions)	21,164	3	141	1,737	5,670	13,614

This table presents summarized estimates of transaction cost and volatility savings for retail investors. Panel A estimates savings in the bid-ask spread (*SPREAD SAVINGS*) due to repurchase activity. Panel B estimates price impact savings (*PIS*) due to repurchase activity. We sort repurchasing firms into quintiles based on the percentage of shares repurchased (*BB_PCTOUT*) over the full sample. Firms in the lowest quintile (Q1) repurchase the smallest percentage of shares outstanding in a given quarter, while firms in the highest quintile (Q5) repurchase the largest percent of shares outstanding. The notation bps represents basis points. One basis point is equal to 0.001.

Table 6. Future Uncertainty and Buybacks

	BB_PCTOUT	*BB_ACTIVE*	*BB_ANNOUNCE*	*BB_UPDATE*	*BB_EXPAND*
HIEXPVOL	0.002***	0.119***	0.017***	0.121***	0.012***
	(11.18)	(17.47)	(8.55)	(11.73)	(9.28)
SIZE	−0.000	0.006**	0.012***	0.005	−0.000
	(−1.39)	(2.02)	(8.60)	(1.54)	(−0.09)
LEVERAGE	0.001**	−0.046**	−0.035***	−0.098***	−0.008**
	(2.13)	(−2.50)	(−6.12)	(−4.59)	(−2.46)
MTB	−0.000***	−0.007***	−0.001	−0.014***	0.000
	(−8.89)	(−2.98)	(−1.63)	(−5.94)	(0.39)
ROA	0.019***	0.869***	0.256***	1.007***	0.147***
	(12.29)	(12.22)	(10.47)	(12.19)	(6.81)
CASH	0.002*	−0.124***	0.022***	−0.106***	0.005
	(1.77)	(−5.88)	(3.61)	(−3.87)	(1.23)
DIVIDENDS	−0.048***	1.281*	−0.212	2.968***	−0.060
	(−4.16)	(1.89)	(−1.09)	(4.30)	(−0.46)
R&D	0.008	−0.029	0.135***	−0.076	0.079*
	(1.62)	(−0.17)	(2.67)	(−0.41)	(1.90)
FOROPS	0.001***	0.064***	−0.001	0.062***	0.002
	(3.99)	(6.83)	(−0.44)	(5.79)	(1.27)
ANALYSTS	0.000***	0.041***	−0.000	0.025***	0.002***
	(7.22)	(10.59)	(−0.28)	(6.58)	(2.93)
OPTIONS	0.001	−0.202**	0.015	−0.347**	−0.008
	(0.54)	(−2.07)	(0.66)	(−2.45)	(−0.59)
S&P500	0.003***	0.237***	0.002	0.135***	0.008***
	(9.30)	(16.85)	(0.35)	(8.09)	(3.26)
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Quarters	186,863	186,863	186,863	186,863	186,863
Adjusted R^2	0.049	0.195	0.024	0.286	0.016

This table presents results from an OLS regression estimate of the ratio of buyback activity and disclosures. The variable *HIEXPVOL* equals 1 if the ratio of the implied volatility on 30-day ATM stock options divided by the adjusted implied volatility on the 91-day ATM stock options on the first day of the quarter is above the sample median for each calendar-quarter. All regressions include industry (two-digit SIC) and time (calendar-quarter) fixed effects. *t*-statistics are presented in parentheses based on robust standard errors double clustered at the firm and calendar-quarter levels. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. We define variables in the Appendix.

Table 7. Political Uncertainty and Buybacks

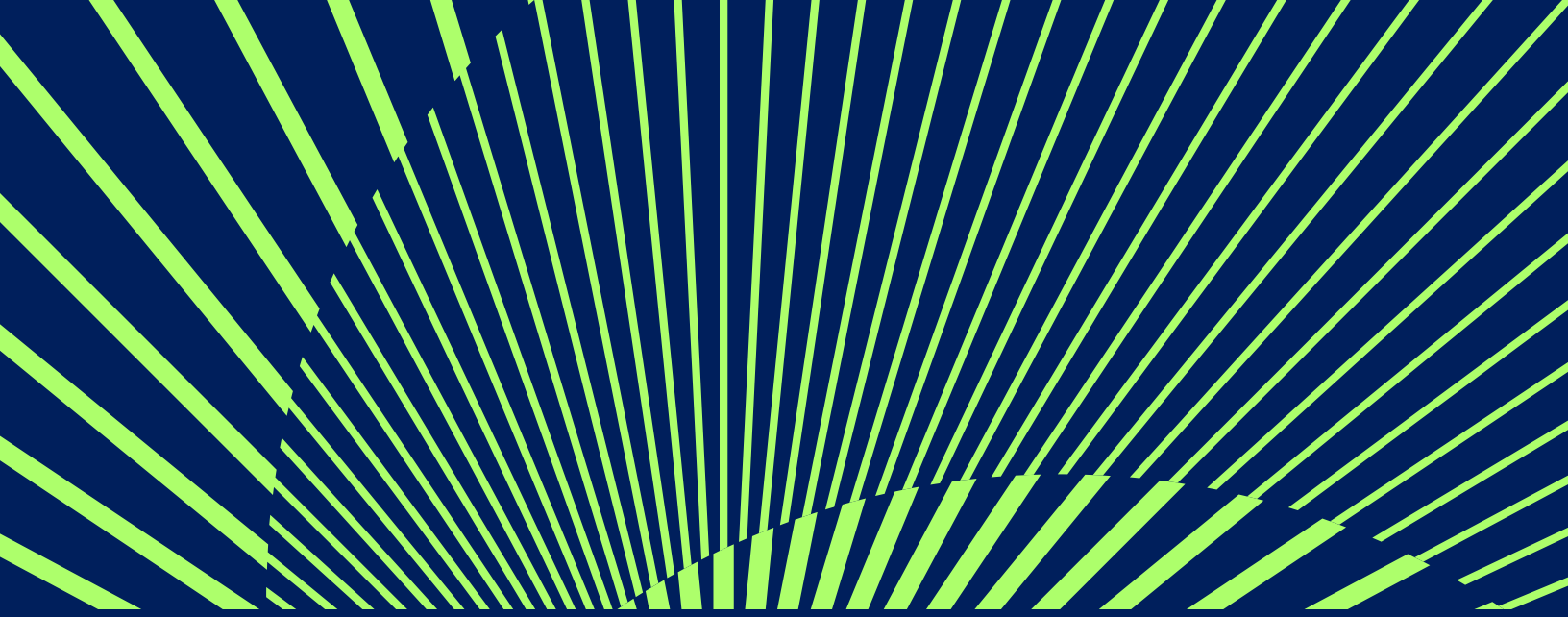
	BB_PCTOUT	*BB_ACTIVE*	*BB_ANNOUNCE*	*BB_UPDATE*	*BB_EXPAND*
EPU	−0.000	0.114***	−0.073***	1.136***	0.007
	(−0.34)	(5.72)	(−9.95)	(48.38)	(1.63)
SIZE	0.000**	0.059***	0.009***	0.119***	0.006***
	(2.24)	(17.95)	(9.46)	(27.68)	(10.43)
LEVERAGE	−0.001**	−0.062***	−0.046***	−0.041***	−0.011***
	(−2.01)	(−5.35)	(−12.26)	(−2.67)	(−4.23)
MTB	−0.000***	−0.004***	−0.002***	0.002*	0.000
	(−7.04)	(−3.15)	(−5.47)	(1.71)	(0.32)
ROA	0.004**	0.087***	0.091***	−0.276***	0.026***
	(2.30)	(3.19)	(8.89)	(−8.58)	(3.96)
CASH	−0.000	−0.001	0.012***	0.036**	0.005**
	(−0.18)	(−0.06)	(2.97)	(2.23)	(2.01)
DIVIDENDS	0.020***	2.827***	0.489***	6.417***	0.252***
	(2.65)	(9.14)	(3.07)	(15.29)	(2.83)
R&D	0.005*	0.381***	0.071***	0.513***	0.069***
	(1.89)	(6.18)	(3.45)	(6.91)	(4.86)
FOROPS	0.000	0.046***	−0.001	0.103***	0.003*
	(1.23)	(5.85)	(−0.22)	(10.07)	(1.79)
ANALYSTS	0.001***	0.041***	0.008***	0.074***	0.003***
	(6.71)	(10.87)	(5.54)	(15.78)	(3.20)
OPTIONS	0.000	−0.093***	0.012	−0.348***	−0.029***
	(0.32)	(−2.61)	(1.03)	(−3.52)	(−2.84)
S&P500	0.001***	0.075***	0.006	0.070***	0.009***
	(3.20)	(4.86)	(1.11)	(3.54)	(2.96)
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No
Firm Quarters	340,043	340,043	340,043	340,043	340,043
Adjusted R^2	0.097	0.439	0.058	0.467	0.067

This table presents results from an OLS regression estimate of the ratio of buyback activity and disclosures. The variable EPU is the quarterly average value of the normalized index value of the volume of news articles discussing economic policy uncertainty from Baker et al. (2016). All regressions include firm fixed effects (which absorbs industry fixed effects), but do not include time fixed effects as these would absorb the EPU variable. t-statistics are presented in parentheses based on robust standard errors clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. We define variables in the Appendix.

Table 8. Institutional Trading and Buybacks

	BB_PCTOUT	*BB_ACTIVE*	*BB_ANNOUNCE*	*BB_UPDATE*	*BB_EXPAND*
IOPCT_SELL	0.067***	3.010***	0.706*	3.701***	0.358
	(3.93)	(5.60)	(1.99)	(9.43)	(1.29)
IOPCT_BUY	0.011	0.761*	−0.103	1.643***	0.018
	(0.66)	(1.67)	(−0.69)	(2.92)	(0.12)
IOPCT_OWN	0.002***	0.164***	−0.005	0.124***	0.009***
	(10.96)	(15.19)	(−1.28)	(7.20)	(5.74)
SIZE	0.000***	0.019***	0.012***	0.016***	0.001***
	(2.74)	(9.71)	(12.13)	(7.11)	(3.40)
LEVERAGE	0.000	−0.060***	−0.034***	−0.095***	−0.009***
	(0.43)	(−4.63)	(−9.47)	(−6.17)	(−4.51)
MTB	−0.000***	−0.001	−0.000	−0.004**	0.001
	(−5.18)	(−0.41)	(−0.36)	(−2.20)	(1.55)
ROA	0.008***	0.389***	0.129***	0.476***	0.066***
	(6.89)	(9.80)	(10.51)	(9.27)	(7.05)
CASH	0.001	−0.094***	0.005	−0.097***	0.000
	(1.54)	(−7.39)	(1.46)	(−5.97)	(0.05)
DIVIDENDS	−0.005	3.361***	0.136	5.062***	0.126
	(−0.58)	(6.79)	(0.96)	(8.67)	(1.50)
R&D	0.001	−0.020	0.048*	−0.136	0.025
	(0.22)	(−0.23)	(1.89)	(−1.40)	(1.40)
FOROPS	0.000***	0.049***	0.001	0.051***	0.002*
	(4.57)	(7.32)	(0.80)	(6.35)	(1.71)
ANALYSTS	0.000***	0.029***	0.002**	0.017***	0.002***
	(4.44)	(7.82)	(2.08)	(4.63)	(2.93)
OPTIONS	0.001	−0.176***	0.027*	−0.246***	−0.012*
	(0.66)	(−3.74)	(1.76)	(−3.80)	(−1.71)
S&P500	0.003***	0.261***	0.007	0.147***	0.011***
	(11.17)	(19.46)	(1.61)	(8.79)	(4.59)
Industry FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Quarters	340,043	340,043	340,043	340,043	340,043
Adjusted R^2	0.036	0.200	0.024	0.273	0.014

This table presents results from an OLS regression estimate of the buyback activity and institutional trading. The variables *IOPCT_SELL*, *IOPCT_BUY,* and *IOPCT_OWN* represents the percentage of shares sold, bought, and owned by institutional investors during the quarter. All regressions include industry (two-digit SIC) and time (calendar-quarter) fixed effects. t-statistics are presented in parentheses based on robust standard errors double clustered at the firm and calendar-quarter levels. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. We define variables in the Appendix.



U.S. Chamber of Commerce
Center for Capital Markets
Competitiveness