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ARTICLE

Do exchange traded funds affect corporate cash holdings?

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Abstract

We examine the effects of equity ownership by exchange traded funds (ETFs) on corporate cash holdings. We find that firms increase their cash holdings in response to higher anticipated risks generated by ETFs. To establish a causal interpretation, we use the Russell 1000/2000 index reconstitution as an instrument for ETF ownership. We further show that shareholders place a higher value on the additional cash held by firms with higher ETF ownership. These findings are more pronounced among financially constrained firms. Overall, our results suggest that firms hold more precautionary cash to mitigate future funding needs due to higher ETF-induced risks.

KEYWORDS
cash holdings, ETF ownership, exchange traded funds, financial constraints

JEL CLASSIFICATION
G23, G32

1 | INTRODUCTION

The demand for exchange traded funds (ETFs) has grown markedly in recent decades (Statista Research Department, 2022), with total global ETF assets under management surging from only $105 billion in 2001 to $10 trillion by the

end of 2021 and anticipated to continue to climb.[1] More critically, ETF trading accounts for approximately 35% of the total trading volume in the U.S. equity markets (Ben-David et al., 2018).

Given the growing popularity of ETFs, researchers have attempted to investigate the asset pricing implications of ETF ownership. The empirical evidence is mixed. For example, prior studies document that an increase in ETF ownership is accompanied by increases in stock return comovement (Da & Shive, 2018), stock return volatility (Ben-David et al., 2018), market fragility and systemic risk (Bhattacharya & O'Hara, 2018; Pagano et al., 2019) and declines in stock price informativeness and information efficiency (Bhojraj et al., 2020; Israeli et al., 2017). However, Sağlam et al. (2019) find that ETF ownership increases the stock liquidity of the underlying stocks in the ETF's basket. Furthermore, Li et al. (2018) show that ETF ownership positively impacts a firm's investment sensitivity to its stock price.

However, the corporate finance implications of the rising importance of ETFs have not been adequately explored. One important consideration is how ETF ownership affects corporate liquidity management and, in particular, corporate cash holdings. Cash holdings undoubtedly play a critical role at the center of firms' financial policies. Cash holdings enable firms to hedge market risks and increase their financial flexibility to avoid the higher costs of raising external funds and to take advantage of future growth opportunities (Almeida et al., 2004; Gamba & Triantis, 2008; Rapp et al., 2014). Another important reason for focusing on cash holdings is that managers can easily have access to and discretionarily alter cash reserves in response to anticipated changes in market conditions (Dittmar & Mahrt-Smith, 2007). In this paper, we examine whether higher ETF ownership induces firms to hold more or less cash and to what extent the market reacts to such adjustments in cash holdings.

Based upon extant findings on the asset pricing implications of ETFs, we propose the following three competing hypotheses on the effects of ETF ownership on corporate cash holdings: (1) the *precautionary cash hypothesis* (H1) (supported in this study); (2) the *agency (weak monitoring vs. indirect monitoring) hypothesis* (H2) (not supported in this study); and (3) the *liquidity substitution hypothesis* (H3) (not supported in this study). These three hypotheses are associated with competing predictions on the direction of the effects. For example, ETF ownership is expected to increase cash holdings for precautionary purposes (H1) but to decrease them if the ETF provides liquidity substitution (H3). Regarding H2, the directional impact of ETFs on cash holdings will depend on the following two subhypotheses: (1) weak monitoring (a positive sign) and (2) indirect monitoring through short selling threat (a negative sign). Furthermore, ETF ownership is expected to increase the value of cash held for precautionary purposes (H1) and indirect monitoring (H2) but to decrease the value of cash held for personal interests—weak monitoring (H2). In Figure 1, we provide a road map of the three competing hypotheses. The following three paragraphs provide details about these hypotheses.

First, we posit the *precautionary cash hypothesis* (H1) (supported) that a firm with higher ETF ownership holds more cash for precautionary purposes to mitigate future financing needs and to avoid the underinvestment problem. Da and Shive (2018) show that ETFs significantly increase the return comovement of the underlying stocks in the ETF's basket. This is because arbitrageurs frequently take simultaneous opposite positions in the ETF and the underlying stocks; therefore, stocks held by ETFs comove with each other more than is warranted by common exposure to fundamentals. Similarly, Pagano et al. (2019) also find that the excessive comovement induced by ETFs increases systemic risk. Moreover, Ben-David et al. (2018) show that ETFs significantly increase the non-fundamental volatility of the securities in their baskets because ETF funds attract more short-horizon liquidity traders and, therefore, more liquidity shocks propagate to the underlying securities through ETF trading. If we consider excessive risk and volatility together, the direct implication is that firms may anticipate a deterioration in their financial flexibility with an increased cost of capital (Graham & Harvey, 2001). As a result, we expect that firms will increase their precautionary cash holdings in response to the higher anticipated risks and financial frictions generated by ETFs. Furthermore, under the precautionary cash hypothesis (H1), given that precautionary cash can reduce the chance of a firm having to forgo a positive–net present value (NPV) project because it is cash strapped, we expect the marginal value placed on the additional cash holdings induced by higher ETF ownership to be higher among equity holders. Therefore, Figure 1 Panel A indicates

[1] Statista Research Department (2022) "Development of assets of global exchange traded funds (ETFs) from 2003 to 2022" https://www.statista.com/statistics/224579/worldwide-etf-assets-under-management-since-1997/

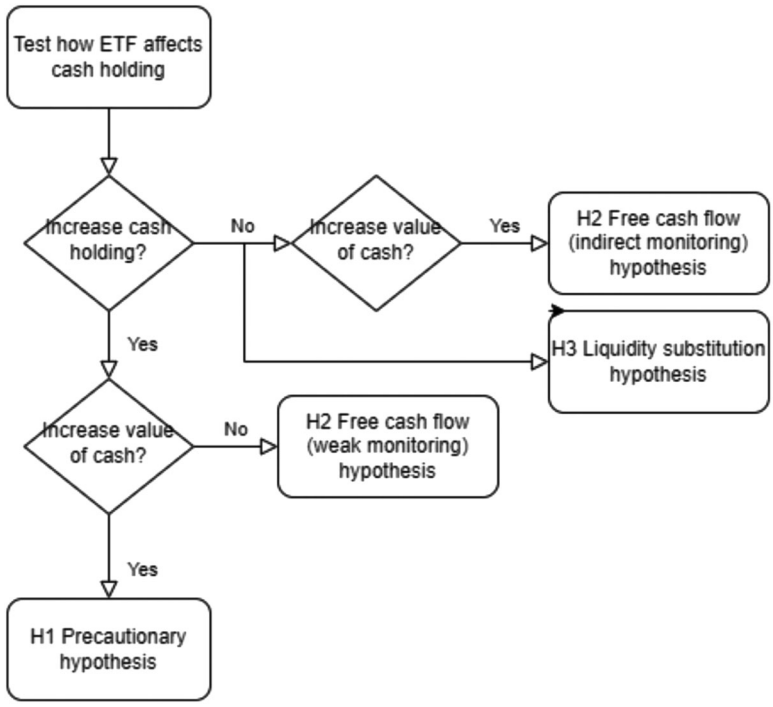

FIGURE 1 Road map.

the expectation that the sign of cash holdings is positive (+) and the sign of the value of cash holdings is positive (+) for H1.

Second, we posit the *agency (weak monitoring vs. indirect monitoring) hypothesis* (H2) (not supported in this study) that a firm with higher ETF ownership holds more cash but a lower value arising from weak shareholder monitoring and agency problems. On the one hand, given that ETFs attract short-horizon noise traders who trade on liquidity or mimic indexes (Ben-David et al., 2018; Israeli et al., 2017), they are unlikely to monitor managerial performance (Callen & Fang, 2013; Chen et al., 2007; Dasgupta & Piacentino, 2015; Heath et al., 2022; Levit, 2018; Schmidt & Fahlenbrach, 2017). With weaker shareholder monitoring, managers may hoard more cash to pursue their personal interests (posing an agency problem) (Jensen & Meckling, 1976). Hence, although the agency problem may increase cash holdings (Dong et al., 2021), the value of cash holdings decreases significantly (Dittmar & Mahrt-Smith, 2007; Pinkowitz et al., 2006). Therefore, Figure 1 Panel A indicates the expectation that the sign of cash holdings is positive (+) but the sign of the value of cash holdings is negative (−) for H2 if the monitoring arising from ETF ownership is weakened. In contrast, recent evidence shows that, different from a passively managed fund, an ETF has an indirect monitoring function. For example, the low fee strategy induces ETFs to supply lendable shares to the short-selling market, which disciplines earning management (Massa et al., 2015). The *ex-ante* short selling potential has a disciplinary effect on managerial misconduct such as empire building (Chang et al., 2019). Such disciplinary potential prevents managers from maintaining more free cash flow that can be beneficial to empire building. Such an "indirect" monitoring effect also improves information efficiency (Huang et al., 2021; Lundholm, 2021; Nallareddy, 2020). Therefore, in Figure 1 Panel A, regarding H2, we expect the sign of cash holdings to be negative (−) but the sign of the value of cash holdings to be positive (+) if indirect monitoring arises from ETF ownership.

Third, we posit the *liquidity substitution hypothesis* (H3) (not supported in this study) that a firm with higher ETF ownership holds less cash because ETF ownership provides liquidity substitution so that a firm does not need to hold more cash. Prior studies have documented that ETF trading leads to higher stock liquidity (Sağlam et al., 2019). The

reason is that ETFs attract additional uninformed investors into the market and, therefore, decrease the transaction costs of stocks for institutional investors. Hence, ETF ownership leads to an overall increase in the breadth of the investor base for the underlying stocks. In response, managers may have lower incentives to build up internal liquidity (i.e. the balance of cash reserves) when the external liquidity (i.e. stock liquidity) is higher, and cash holdings may in turn decrease with higher ETF ownership. This notion is based on the theory that when firms acquire enough external liquidity through the stock market, they have less motivation to hold cash because both the equity and debt costs of capital are lower (Butler et al., 2005; Huang et al., 2015), increasing the opportunity cost of holding (Neamtiu et al., 2014). Therefore, this competing hypothesis (H3) implies that managers are more likely to reduce cash holdings with higher ETF ownership. Therefore, Figure 1 Panel A indicates the expectation that the sign of cash holdings is negative (−) for H3.

Figure 1 Panel B shows the testing road map. We test the three hypotheses using a comprehensive sample of U.S. stocks from 2000 to 2021. We identify ETF funds from multiple data sources, including CRSP and Compustat. We then compute firm-level ETF ownership from the Thomson Reuters Mutual Fund Holdings database. We proceed as follows. First, we test the cash holding implications (increase or decrease) of ETF ownership. Following Opler et al. (1999), we find through our baseline regression that a significantly positive relationship exists between ETF ownership and cash holdings. A one-standard-deviation increase in ETF ownership leads to a 4.37% increase in corporate cash holdings relative to the unconditional mean. Our results are robust after substituting the dependent variable with a series of traditional cash holding measures. Therefore, our results SUPPORT the *precautionary cash hypothesis* (H1) or *agency (weak monitoring) hypothesis* (H2) but REJECT the *liquidity substitution hypothesis* (H3).

To mitigate concerns of endogeneity, we follow Ben-David et al. (2018) and employ a quasi-natural experiment based on the annual reconstitution of the Russell indexes.[2] We test our hypothesis using an instrumental variable (IV) model, in which we use the index-switching event between the Russell 1000 and 2000 indexes as an instrument for ETF ownership. Our result from the IV model consistently shows that an increase in ETF ownership leads firms to hold more cash when we use bandwidths ranging from 150 to 300 stocks around the cutoff (1000th market capitalization).

To disentangle whether the positive effect of ETF ownership on the cash level is posited by the *precautionary cash hypothesis* (H1) or the *agency (weak monitoring) hypothesis* (H2), we test the relationship between ETF ownership and the value of cash. The *precautionary cash hypothesis* predicts a positive relationship between ETF ownership and the value of cash holdings. The additional cash holdings will be more valuable because they allow firms to not only mitigate excessive risk and volatility but also pursue value-adding investments that they might otherwise have to bypass. In contrast, the *agency (weak monitoring) hypothesis* predicts a negative relationship between ETF ownership and the value of cash holdings because week shareholder monitoring from ETF ownership allows managers with larger cash reserves to pursue more value-destroying activities (Jensen, 1986; Masulis et al., 2007; Schmidt & Fahlenbrach, 2017). Following Faulkender and Wang (2006), we examine how ETF ownership affects the marginal value of cash holdings and find a positively significant association between ETF ownership and the value of cash holdings. For example, a one-standard-deviation increase in ETF ownership is associated with an increase in the value of an additional dollar of cash by 6.94 cents (or 6.11%) for an average firm, which is economically significant. We also test the association between ETF and corporate governance and find no results, so we further reject H2. Therefore, our results provide **support for** the *precautionary cash hypothesis* (H1) and do **not** provide **support** for the *agency hypothesis* (H2).

Next, we investigate the sources that firms tap to increase their cash reserves. In principle, managers can increase cash holdings by issuing debt or equity, by saving from internal cash flows, or by saving from other sources. Therefore, we follow McLean (2011) and regress changes in cash holdings on the interactions between ETF ownership and the above sources of cash along with controls. In particular, we find that firms with higher ETF ownership tend to save more cash from internal cash flows.

[2] Quasi-natural experiments based on the annual reconstitution of the Russell indexes have also been used in other recent studies, such as Chang et al. (2014), Appel et al. (2016), and Schmidt and Fahlenbrach (2017).

To understand the channel by which ETF ownership increases cash holdings for precautionary purposes, we examine the relationship between ETF ownership and the market beta. One plausible channel is that managers increase the cash level to overcome excessive risk due to ETF exposure because the return comovement of the underlying stocks in the ETF's basket enhances the systemic risk and non-fundamental volatility of the securities in the baskets (Ben-David et al., 2018; Da & Shive, 2018; Pagano et al., 2019). Using both an Ordinary Least Squares (OLS) approach and an IV approach, we find that ETF ownership is strongly positively related to the market beta. These findings suggest that ETF funds increase the market comovement risks of the underlying stocks. We further find that high cash holdings can mitigate the impact of ETF ownership on comovement risk.

Furthermore, we decompose the overall ETF ownership into broad and sector ETF ownership.[3] Given that broad ETF ownership has been found to be particularly detrimental to the information efficiency of stock prices (Bhojraj et al., 2020), we examine whether it is broad ETF ownership that drives the positive relationship between ETF ownership and cash holdings. To test this prediction, we replace our ETF ownership measure with both broad and sector ETF ownership in our baseline regressions. We find that this is indeed the case. Broad ETF ownership economically contributes twice as much as sector ETF ownership to the increase in cash holdings.

To further extend our study, we also examine the association between the excess cash holding level and ETF ownership as a robustness test because excess cash reflects abnormal cash reserves (Bates et al., 2009, 2018) and predicts higher future risk potential (Simutin, 2010). The regression results support the *precautionary cash hypothesis*. We also conduct a series of cross-sectional tests. The results from the subsample tests further confirm the *precautionary cash hypothesis*. In particular, we perform subsample analyses by splitting the sample by measures of financial constraints and shareholder monitoring. For financial constraints, we split the sample by the Whited and Wu (2006) financial constraint index and the size and age (SA) financial constraint index (Hadlock & Pierce, 2010). For shareholder monitoring, we split the sample by the degree of dedicated investor ownership (Balakrishnan et al., 2018; Bushee, 1998) and the number of blockholders (Edmans & Manso, 2010; Kang et al., 2018). We find that the results for the value of cash holdings are more pronounced among financially constrained firms and firms with stronger shareholder monitoring. These results provide further support for the *precautionary cash hypothesis*.

Our study makes three contributions to the literature. First, we contribute to the emerging literature on ETFs. While ETF trading has become increasingly popular in recent decades, its impact at the corporate level has not been well studied. We contribute to this literature by studying how a firm's ETF ownership can have a real impact on its corporate liquidity management in terms of both the level of cash holdings and the value of cash holdings.

Second, we contribute to the literature on the determinants of corporate cash holdings.[4] Our results provide a possible alternative explanation for the phenomenon of increasing corporate cash in recent decades (Bates et al., 2009). We demonstrate that firms respond to increasing ETF ownership by holding more precautionary cash.

Third, we contribute to the debate in the corporate cash holdings literature on whether cash holdings are value increasing.[5] Our analysis establishes that increasing "precautionary" cash holdings to avoid the underinvestment problem is a value-increasing response to the increased risk induced by ETF ownership.

The remainder of the paper proceeds as follows. Section 2 describes our data and method. Section 3 shows our empirical results. Section 4 investigates the channels. Section 5 presents the mechanism tests, and Section 6 concludes the paper.

[3] We manually search the ETF names to identify whether the ETFs focus on specific sectors (e.g. technology, retail and financial) or follow broad market indexes (e.g. Russell 1000, Russell 2000 and S&P 500).

[4] See, for example, Opler et al. (1999), Harford et al. (2008), Chen et al. (2012), Neamtiu et al. (2014), Chung et al. (2015), Bates et al. (2018), Atif et al. (2019) and Garg (2020).

[5] See, for example, Faulkender and Wang (2006), Dittmar and Mahrt-Smith (2007), Denis and Sibilkov (2009), Tong (2010), Orlova et al. (2017), Bates et al. (2018), Chi and Su (2016), and Lu and Wu (2018).

2 | DATA AND SUMMARY STATISTICS

2.1 | Data and variables

We first identify all ETFs traded on the U.S. exchanges from the Center for Research in Security Prices (CRSP), Compustat and MFLinks. In particular, ETFs are identified as securities on CRSP with a share code of 73.[6] We then merge the ETF data with the ETF holdings data documented in the Thomson Reuters Mutual Fund Holdings S12 master database (TRMF-S12) using the MFLINKS table.[7] We next obtain each ETF's holding data. In our analysis, we focus on ETFs that are listed on U.S. exchanges and whose baskets contain U.S. stocks. Our final sample consists of data on 529 distinct equity ETFs in the United States from between January 2000 and December 2021.[8]

To construct ETF ownership, we employ two methods from the literature. In the first measure, we follow Israeli et al. (2017, hereafter ILS) and define the ETF_{ILS} of stock i in quarter t as the aggregate number of shares held by all ETFs divided by the total number of shares outstanding at the end of the quarter, as defined in Equation (1):

$$ETF_{ILS} = \frac{Shares\ held\ by\ all\ ETF_{i,t}}{Total\ share\ outstandings_{i,t}}. \tag{1}$$

In the second measure, we follow Ben-David et al. (2018, hereafter BFM) and define ETF_{BFM} of stock i in quarter t as the sum of the dollar value of holdings by all ETFs investing in the stock divided by the stock's capitalization at the end of the quarter, which is defined in Equation (2):

$$ETF_{BFM} = \frac{\sum_{j=1}^{J} w_{i,j,t} AUM_{j,t}}{Mkt\ Cap_{i,t}}, \tag{2}$$

where J is the set of ETFs that hold stock i, $w_{i,j,t}$ is the weight of the stock in the portfolio of ETF j in quarter t, and $AUM_{j,t}$ is the assets under management by ETF j at the end of the quarter.

We obtain data on cash holdings and the determinants of cash holdings from Compustat. To be consistent with other studies on cash holdings, we exclude financial firms and utility firms (Standard Industrialization Codes [SIC] 6000–6999 and 4900–4999) from our sample because their cash holdings are subject to statutory capital requirements or regulatory supervision in many jurisdictions. Our final sample contains 8718 unique firms and 186,976 firm–quarter observations.

We define a firm's *cash level* as the natural logarithm of one plus the ratio of cash to net assets, $Ln(1 + Cash/Net\ Asset)$.[9] We then consider an array of firm-level controls used in prior studies on corporate cash holdings (Harford et al., 2008; Opler et al., 1999). *Size* is defined as the natural logarithm of net assets, where net assets are calculated as total assets less cash and marketable securities. *Cashflow* is measured as operating income before depreciation, interest and taxes. *Net working capital* is calculated as current assets minus current liabilities. The *market-to-book* ratio is calculated as the sum of the market value of equity and total liability divided by net assets. *R&D expenses* refer to research and development expenses (any missing values are replaced with zeros). *Capital expenditures* refer to capital expenditures. *Market leverage* is calculated as total debt divided by the sum of total debt and market value of equity. *Industry sigma* is a measure of the volatility of an industry's cash flow in the previous 20-quarter

[6] We also follow Glosten et al. (2021) and double check our sample of ETFs using CRSP mutual fund database. In particular, all ETFs in our sample show "*etflag*" or "F" in the CRSP mutual fund database.

[7] The MFLINKS table links the CRSP and TRMF-S12 fund identifiers so that we can obtain ETF holdings data.

[8] These statistics are similar to those of Israeli et al. (2017), who identify 443 unique ETFs in the United States between 2000 and 2014. Our ETF ownership measures are slightly lower than the measure of Ben-David et al. (2018) (e.g. 2.6%) because we use a broader sample of firms in our analysis.

[9] We use Ln(1+Cash/Net Asset) rather than Ln(Cash/Net Asset) to avoid losing firms with zero cash. In our robustness checks, we also substitute our cash level measure with Ln(Cash/Asset), Ln(Cash/Revenue), Ln(Cash) and (Cash/Net Assets) to ensure that our results are not driven by firm size, revenue or the logarithmic transformation of the cash measure.

period. Industries are defined by 2-digit SIC codes. *Common dividend* is a dummy variable that takes a value of one for dividend-paying firms and zero otherwise. *Active (index) fund ownership* refers to the sum of the ownership by all active (index) mutual funds holding the stock.[10] All ratio variables are winsorized at the 1st and 99th percentiles. All variable definitions are detailed in the Appendix.

2.2 | Summary statistics

Table 1 reports a summary of the descriptive statistics of the variables used in our main analysis. Our sample includes 186,976 firm–quarters from U.S. publicly traded firms over the period from 2000 to 2021. Panel A summarizes the variables used in the analysis for cash level and ETF ownership, and Panel B shows the variables used in the analysis for the value of cash and ETF ownership. In Panel A, the cash level is 0.352 on average, equivalent to approximately 42.19% (exp(0.352) − 1) in cash and cash equivalent relative to net assets (excluding cash and cash equivalent).[11]

Our variables of interest, ETF ownership measured by ETF_{ILS} and ETF_{BFM}, have means of 2.34% (ranging from 0% to 9.99%) and 2.30% (ranging from 0% to 10.2%), respectively. Our ETF ownership measures are similar to those of ILS and BFM. For example, BFM (2018) find that ETF ownership for S&P 500 firms is 2.60% and that ETF ownership for Russell 3000 firms is 2.80%. Overall, our ETF ownership measures are consistent with their counterparts in the literature. The ETF_{ILS} and ETF_{BFM} measures of ETF ownership are highly correlated, with a correlation of 0.95.

We also report the other characteristics of our sample firms. The market-to-book ratio is relatively high, with an average of 7.01, because the book value is calculated using the book value of net assets (net of cash and cash equivalent). We also calculate the market-to-book ratio using the book value of total assets with a mean of 2.26 and a median of 1.54. On average, our firms have a market capitalization of $4.17 billion and invest 9.05% of net assets in R&D and 4.13% of net assets in capital expenditure. On average, our firms take on debt amounting to 22.82% of their total value. This figure aligns with the range reported by Woods et al. (2019), which is between 17% and 24%. Additionally, 36.41% of the firms in our sample distribute dividends, a percentage that closely mirrors the 38% documented by Tan et al. (2021).

Table 1 Panel B provides the descriptive statistics for the variables in our analysis of the value of cash. The excess return has an average of −2.79% and a median of −9.11%, consistent with the findings in Faulkender and Wang (2006).[12] We find that the change in the cash ratio has a mean of 0.013 in comparison to the mean of 0.004 in Faulkender and Wang (2006), consistent with the recent trend of increasing cash holdings (Bates et al., 2009). The descriptive statistics of other variables are generally consistent with the statistic values in Faulkender and Wang (2006). For example, our sample firms have a change in earnings ratio of 1.61%, in comparison to 1.12% in Faulkender and Wang (2006).

3 | ETF OWNERSHIP AND CASH HOLDINGS

3.1 | Baseline regression results with firm fixed effects

To examine the relationship between ETF ownership and the level of corporate cash holdings, we follow the approach developed by Opler et al. (1999). Specifically, we run an OLS regression of the cash measure on one of the two

[10] We excluded ETF from index funds. In our sample, the correlation between ETF ownership and index (active) fund ownership is 0.50 (0.41).

[11] Our cash level measure is scaled by net assets. We also calculate the cash ratio scaled by total assets. The mean of cash to total assets is equal to 18.91%, consistent with the reported means in the cash holdings literature. For example, Opler et al. (1999) find an average cash-to-assets ratio of 17%. Dittmar and Mahrt-Smith (2007) find an average cash-to-assets ratio of 22%. Bates et al. (2009) find an average cash-to-assets ratio of 23%. Heeney et al. (2023) find an average cash-to-assets ratio of 13.7%.

[12] Faulkender and Wang (2006) report excess returns with a mean of −0.5% and a median of −8.5% for the sample period from 1972 to 2001.

TABLE 1 Descriptive statistics.

Panel A. Descriptive statistics for cash level and ETF ownership					
N = 186,976 (firm–quarter observations)					
Variable	**Mean**	**SD**	**P25**	**Median**	**P75**
Cash level	0.3521	0.6034	0.0343	0.1137	0.3532
ETF_{ILS}	0.0234	0.0272	0.0005	0.0127	0.0367
ETF_{BFM}	0.0230	0.0277	0.0003	0.0124	0.0347
Size	5.8049	2.4340	4.0709	5.9467	7.5382
Cashflow	−0.1363	0.8115	−0.0051	0.0198	0.0357
Net working capital	0.9324	3.0207	0.0666	0.2390	0.5539
Market-to-book ratio	7.0071	19.3772	1.2493	1.8424	3.5093
R&D expenditures	0.0905	0.3543	0.0000	0.0000	0.0245
Acquisitions	0.0166	0.0519	0.0000	0.0000	0.0012
Capital expenditures	0.0413	0.0591	0.0084	0.0208	0.0480
Market leverage	0.2282	0.2365	0.0247	0.1573	0.3542
Industry sigma	1.1736	0.7292	0.7031	1.0912	1.6268
Common dividend	0.3641	0.4812	0.0000	0.0000	1.0000
Active fund ownership	0.1729	0.1406	0.0512	0.1601	0.2676
Index fund ownership	0.0229	0.0284	0.0028	0.0131	0.0322
Panel B. Descriptive statistics for the value of cash and ETF ownership					
N = 39,937 (firm–year observations)					
Variable	**Mean**	**SD**	**P25**	**Median**	**P75**
Stock return ($r_{i,t}$)	0.1716	0.9503	−0.2180	0.0647	0.3699
Benchmark return ($R^B_{i,t}$)	0.1761	0.3059	−0.0026	0.1507	0.3172
Excess return ($r_{i,t} - R^B_{i,t}$)	−0.0279	0.5435	−0.3434	−0.0911	0.1751
ETF_{ILS}	0.0261	0.0279	0.0016	0.0178	0.0408
ETF_{BFM}	0.0254	0.0275	0.0019	0.0169	0.0384
Change in cash ratio (ΔC)	0.0126	0.1487	−0.0260	0.0025	0.0389
Change in earnings ratio (ΔE)	0.0161	0.2067	−0.0272	0.0044	0.0339
Change in net asset ratio (ΔNA)	0.0419	0.4049	−0.0327	0.0219	0.1052
Change in R&D ratio (ΔRD)	0.0005	0.0206	0.0000	0.0000	0.0018
Change in interest ratio (ΔI)	0.0007	0.0163	−0.0014	0.0000	0.0019
Change in dividend ratio (ΔD)	0.0002	0.0086	0.0000	0.0000	0.0001
Lagged cash ratio (C_t-_1)	0.1815	0.2432	0.0400	0.1018	0.2235
Leverage (L)	0.2001	0.2142	0.0162	0.1350	0.3083
Net financing ratio	0.0275	0.2024	−0.0377	−0.0005	0.0388
Active fund ownership	0.1870	0.1290	0.0741	0.1817	0.2796
Index fund ownership	0.0269	0.0263	0.0076	0.0189	0.0378

Note: This table provides the descriptive statistics of the variables in our sample of U.S. publicly traded firms from 2000 to 2021. The table presents the means, standard deviations and different percentiles (25th, 50th and 75th percentiles). Panel A reports the descriptive statistics of all variables used in the cash level and ETF ownership analysis at the firm–quarter level, and Panel B reports the descriptive statistics of all variables used in the value of cash and ETF ownership analysis at the firm–year level. ETF_{ILS} is calculated as the percentage of firm *i*'s common shares outstanding held by ETFs at the end of each quarter, averaged at the yearly level. ETF_{BFM} is calculated as the sum of ownership of all ETFs holding the stock at the end of each quarter, averaged at the yearly level. In Panel A, net assets (NA) in the denominators of variables are calculated as total assets less cash and marketable securities. In Panel B, all ratio variables are scaled by lagged market equity (the price in year $t-1$ multiplied by shares outstanding in year $t-1$). All variables are winsorized at the 1st and 99th percentiles. All variable definitions are provided in the Appendix.

measures of ETF ownership (ETF_{ILS} and ETF_{BFM}) and other commonly used cash determinants suggested by the literature. We include year and firm fixed effects in our analysis, and our results are reported with firm-clustered standard errors. The regression is as follows:

$$\begin{aligned} Cash\ level_{i,t} = {} & \beta_1 ETF\ ownership_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 Cashflow_{i,t-1} \\ & + \beta_4 Net\ working\ capital_{i,t-1} + \beta_5 Market\ to\ book\ ratio_{i,t-1} \\ & + \beta_6 CR\&D\ expense_{i,t-1} + \beta_7 Acquisitions_{i,t-1} + \beta_8 Capital\ expenditures_{i,t-1} \\ & + \beta_9 Market\ leverage_{i,t-1} + \beta_{10} Industry\ sigma_{i,t-1} + \beta_{11} Common\ dividend_{i,t-1} \\ & + \beta_{12} Active\ fund\ ownership_{i,t-1} + \beta_{13} Index\ fund\ ownership_{i,t-1} \\ & + \gamma_i + \delta_t + \varepsilon_{i,t} \end{aligned} \tag{3}$$

The dependent variable is firm *i*'s cash level in quarter *t*, measured as the natural logarithm of one plus the ratio of cash to net assets, *Ln*(1 + *Cash*/*Net Asset*). The variable of interest is ETF ownership in two different measures: ETF_{ILS} and ETF_{BFM}. We also include other cash determinants suggested by Opler et al. (1999) as control variables. These control variables include *size* ($Ln(NA_{i,t-1})$), *cashflow* ($\frac{FCF_{i,t-1}}{NA_{i,t-1}}$), *net working capital* ($\frac{NWC_{i,t-1}}{NA_{i,t-1}}$), *market-to-book ratio* ($\frac{MV_{i,t-1}}{NA_{i,t-1}}$), *research and development expenses* ($\frac{RD_{i,t-1}}{NA_{i,t-1}}$), *acquisitions* ($\frac{Acquisitions_{i,t-1}}{NA_{i,t-1}}$), *capital expenditure* ($\frac{CAPX_{i,t-1}}{NA_{i,t-1}}$), *market leverage* ($L_{i,t-1}$), *industry sigma* and *payout to shareholders* ($Dividends_{i,t-1}$). Note that $M_{i,t-1}$ in the denominator of controls is the market value of equity in the prior year. We also include active and index fund ownership in our model because they are likely correlated with ETF ownership. γ_i and δ_t capture the firm and time fixed effects, respectively.

Table 2 reports the estimates from the regression of the level of cash holdings on ETF ownership shown in Equation (3). The results for the variables of interest capturing ETF ownership, ETF_{ILS} and ETF_{BFM}, are reported in Columns (1) and (2) and in Columns (3) and (4), respectively. We include control variables from Opler et al. (1999) in Columns (1) and (3). The coefficients on ETF_{ILS} and ETF_{BFM} are significantly positive at the 1% level, suggesting that firms hold more cash when they experience higher ETF ownership. In Columns (2) and (4), we also control for active and index fund ownership. Columns (2) and (4) show that our baseline results in Columns (1) and (3) are not affected by the addition of these investor ownership variables.

Economically, the results indicate that a one-standard-deviation change in ETF ownership is positively related to an increase of 3.66% (for ETF_{ILS}) or 3.32% (for ETF_{BFM}) in *Ln*(1 + *Cash*/*Net Asset*) from the mean of 35.21%.[13] To reflect the magnitude of the change in the cash ratio, *Cash*/*Net Asset*, we document that an increase in the cash level of 3.66% translates into a 4.37%[14] increase in the mean cash ratio (42.21%), equivalent to a cash increase of 182.07 million U.S. dollars.[15] We also notice that active fund ownership and index fund ownership are statistically significant; however, the economic significances arising from such ownership are lower than that arising from ETF ownership.[16]

[13] The calculations of economic significance for the ETF_{ILS} and ETF_{BFM} measures are as follows: 3.66…% = 0.474*0.0272/0.3521 (coefficient on ETF_{ILS} * S.D. of ETF / mean of Ln(1 + Cash / Net Asset)) and 3.32…% = 0.422*0.0277/0.3521 (coefficient on ETF_{BFM} * S.D. of ETF / mean of Ln(1+ Cash / Net Asset)), respectively.

[14] Mean cash ratio, (*Cash*/*Net Asset*) = exp(35.21%) − 1 = 42.20507…%; after applying a 3.66…% increase in *Ln*(1 + *Cash*/*Net Asset*), the mean of *Cash*/*Net Asset* increases to 44.05036…% (exp[35.21%*(1+3.66168702…%)]−1). Hence, the cash ratio, (*Cash*/*Net Asset*), increases by 4.37% (44.05036…% / 42.20507…% − 1). Please note that all decimal places are kept in all interim calculations, but we reduce the decimal places in the presentation.

[15] According to our untabulated summary statistics, the mean of net assets is $4166.412 million. A 4.37% increase in (cash / net asset) implies, on average, an increase in cash of $76.88 million (44.05036…%*4166.412 − 42.20507…%*4166.412). Please note that all decimal places are kept in all interim calculations, but we reduce the decimal places in the presentation.

[16] A one-standard-deviation increase in active fund ownership is associated with a 3.19…% increase in *Ln*(1 + *Cash*/*Net Asset*), which can be translated to a 3.81…% increase in the cash ratio from the mean (42.21%). A 3.81…% increase in the cash ratio (*Cash*/*Net Asset*) is equivalent to an increase in cash of 67.02 million U.S. dollars. The magnitude of change in the cash ratio (*Cash*/*Net Asset*) is lower than that arising from ETF ownership. This finding implies that firms have a strong motivation to keep more cash against ETF ownership than against active fund ownership. Similarly, we apply the same calculation and find that

TABLE 2 ETF ownership and the level of cash holdings.

Panel A: Baseline regression				
	(1)	(2)	(3)	(4)
VARIABLES	Cash level: Ln(1+Cash/Net Asset)			
ETF_{ILS} ($t-1$)	0.474***	0.388***		
	(5.57)	(3.89)		
ETF_{BFM} ($t-1$)			0.422***	0.347***
			(5.84)	(4.28)
Size ($t-1$)	−0.112***	−0.120***	−0.112***	−0.120***
	(−27.30)	(−26.56)	(−27.29)	(−26.56)
Cashflow ($t-1$)	0.052***	0.062***	0.052***	0.062***
	(7.09)	(8.15)	(7.09)	(8.15)
Net working capital ($t-1$)	0.076***	0.076***	0.076***	0.076***
	(26.90)	(25.13)	(26.91)	(25.14)
Market-to-book ratio ($t-1$)	0.000	0.000	0.000	0.000
	(1.49)	(1.19)	(1.49)	(1.19)
R&D expenditures ($t-1$)	0.125***	0.121***	0.125***	0.121***
	(6.64)	(6.04)	(6.63)	(6.04)
Acquisitions ($t-1$)	−0.097***	−0.104***	−0.097***	−0.104***
	(−8.43)	(−8.56)	(−8.45)	(−8.56)
Capital expenditures ($t-1$)	0.077***	0.054**	0.077***	0.054**
	(3.42)	(2.23)	(3.43)	(2.22)
Market leverage ($t-1$)	−0.044***	−0.031***	−0.044***	−0.030***
	(−5.58)	(−3.46)	(−5.58)	(−3.40)
Industry sigma ($t-1$)	0.003	0.002	0.003	0.002
	(0.81)	(0.40)	(0.77)	(0.38)
Common dividend ($t-1$)	0.008**	0.007*	0.008**	0.007*
	(2.32)	(1.77)	(2.33)	(1.76)
Active fund ownership ($t-1$)		0.080***		0.083***
		(5.23)		(5.47)
Index fund ownership ($t-1$)		0.160**		0.179**
		(2.27)		(2.41)
Observations	178,823	147,231	178,823	147,231
Adjusted R-squared	0.911	0.916	0.911	0.916
Clustered S.E.	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y

(Continues)

TABLE 2 (Continued)

Panel B: Robustness checks using cash-to-asset ratio				
	(1)	(2)	(3)	(4)
VARIABLES	Cash level: Ln(Cash/Asset)			
ETF_{ILS} (*t*−1)	3.021***	2.325***		
	(5.97)	(4.25)		
ETF_{BFM} (*t*−1)			2.740***	2.211***
			(6.52)	(5.03)
Controls	Y	Y	Y	Y
Active/Index fund controls	N	Y	N	Y
Observations	177,917	146,573	177,917	146,573
Adjusted R-squared	0.821	0.83	0.821	0.83
Clustered S.E.	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y
Panel C: Robustness checks using cash-to-revenue ratio				
VARIABLES	Cash level: Ln(Cash/Revenue)			
ETF_{ILS} (*t*−1)	2.887***	2.522***		
	(5.21)	(4.28)		
ETF_{BFM} (*t*−1)			2.672***	2.426***
			(5.85)	(5.17)
Controls	Y	Y	Y	Y
Active/Index fund controls	N	Y	N	Y
Observations	173,075	143,127	173,075	143,127
Adjusted R-squared	0.806	0.816	0.806	0.816
Clustered S.E.	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y
Panel D: Robustness checks using the level of cash				
VARIABLES	Cash level: Ln(Cash)			
ETF_{ILS} (*t*−1)	3.215***	2.398***		
	(6.37)	(4.38)		
ETF_{BFM} (*t*−1)			2.918***	2.299***
			(6.97)	(5.23)
Controls	Y	Y	Y	Y
Active/Index fund controls	N	Y	N	Y
Observations	177,917	146,573	177,917	146,573
Adjusted R-squared	0.865	0.855	0.865	0.855
Clustered S.E.	Firm	Firm	Firm	Firm

(Continues)

TABLE 2 (Continued)

Panel D: Robustness checks using the level of cash				
VARIABLES	**Cash level: Ln(Cash)**			
Firm F.E.	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y
Panel E: Robustness checks using the cash ratio				
VARIABLES	**Cash ratio: Cash/Net Assets**			
ETF_{ILS} ($t-1$)	0.483***	0.402***		
	(5.80)	(4.04)		
ETF_{BFM} ($t-1$)			0.434***	0.363***
			(6.08)	(4.42)
Controls	Y	Y	Y	Y
Active/Index fund controls	N	Y	N	Y
Observations	178,823	147,231	178,801	147,213
Adjusted R-squared	0.8478	0.8583	0.8478	0.8583
Clustered S.E.	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y

Note: This table presents the estimated coefficients from the regressions explaining the association between cash holdings and ETF ownership along with the other control variables. Our sample covers the 2000–2021 period. Panel A shows the baseline regression results. The dependent variable is the cash level, calculated as the natural logarithm of one plus the ratio of cash and cash equivalents to net assets. For the main explanatory variable, we include the following two measures of ETF ownership: ETF_{ILS} is calculated as the percentage of firm *i*'s common shares outstanding held by ETFs at the end of each quarter, and ETF_{BFM} is calculated as the sum of ownership of all ETFs holding stock *i* at the end of each quarter. Columns (1) and (2) and Columns (3) and (4) report the results obtained using ETF ownership from ETF_{ILS} and ETF_{BFM}, respectively. Columns (1) and (3) are the baseline model from Opler et al. (1999). In Columns (2) and (4), we further control for active fund ownership and index fund ownership. Industries are defined by 2-digit SIC codes. All independent variables are measured in the previous quarter ($t-1$). All ratio variables are winsorized at the 1st and 99th percentiles. Panels B to E show the results of robustness checks using the following four alternative dependent variables: (1) the cash-to-asset ratio, (2) cash-to-revenue ratio, (3) level of cash and (4) cash ratio, respectively. All other settings are the same as those of the baseline model in Panel A. All variable definitions are provided in the Appendix. All regressions are estimated with firm and year–quarter fixed effects and firm-clustered standard errors. Robust *t* statistics are presented in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

To ensure the robustness of our baseline results, we also follow Opler et al. (1999), Harford et al. (2008), Simutin (2010), and Huang and Mazouz (2018) and substitute our cash level measure with other traditional cash measures, such as the cash-to-total asset ratio (*Ln*(*Cash*/*Asset*)), cash-to-revenue ratio (*Ln*(*Cash*/*Revenue*)), level of cash holdings (*Ln*(*Cash*)) and cash ratio (*Cash*/*Net asset*).[17] The results in Table 2 Panels B to E continue to provide support for the positive associations between ETF ownership and the cash level at the 1% level of significance.

the magnitude of the change in the cash ratio (*Cash*/*Net Asset*) arising from index fund ownership is a 0.99…% increase in the cash ratio (equivalent to an increase in cash of $63.87 million), which is still much lower than that arising from ETF ownership. Please note that all decimal places are kept in all interim calculations, but we reduce the decimal places in the presentation.

[17] When constructing the cash ratio (*Cash/Net Asset*) variable, we follow Opler et al. (1999) and truncate the cash-to-net-asset value to one if the value is greater than one.

In summary, thus far, our results support the *precautionary cash hypothesis* or *agency (weak monitoring) hypothesis*, both of which imply that firms hold more cash.[18,19] We will further disentangle the effects associated with these two hypotheses in Section 3.3. However, at this point, our analysis does NOT find supporting evidence for the *liquidity substitution hypothesis* or *agency (indirect monitoring) hypothesis*, which predicts that firms hold less cash.

3.2 | Identification test using Russell index reconstitution

To establish a causal interpretation of the positive relation between ETF ownership and cash holdings, we follow the identification strategy from Ben-David et al. (2018). Specifically, we exploit the variation in ETF ownership using exogenous stock assignments in the Russell 1000 and 2000 indexes. The Russell 1000 index comprises the largest 1000 stocks by market capitalization, while the Russell 2000 index comprises the next 2000 largest stocks. The Russell indexes are reconstituted at the end of June each year based on a stock's end-of-May market capitalization. The arbitrary index assignment has a strong impact on ETF ownership because ETFs track a stock's portfolio weight in the index (Ben-David et al., 2018). For example, the 1000th stock is given a relatively smaller portfolio weight for inclusion in the Russell 1000, while the 1001st stock is given a much larger weight for inclusion in the Russell 2000. In other words, we expect higher ETF ownership for stocks with rankings just after 1000th than stocks with rankings just before 1000th. Therefore, the changes in index membership for stocks with market capitalizations close to the cutoff (1000th) are relatively random events after we control for the assignment variable (market capitalization), which is from a random variation in stock prices at the end of May.

In the IV approach, we define the instrument variable, $Switched_{i,t}$, as a categorical variable taking a value of one if stock *i* belongs to the Russell 1000 index before index reconstitution in year *t* but then switches to the Russell 2000 index after index reconstitution in year *t*. Conversely, $Switched_{i,t}$ equals negative one if stock *i* belongs to the Russell 2000 index before index reconstitution in year *t* but then switches to the Russell 1000 index after index reconstitution in year *t*. Otherwise, $Switched_{i,t}$ takes a value of zero. For example, when $Switched_{i,t}$ is positive (or negative), it means that there will likely be an exogenous increase (decrease) in ETF ownership.[20]

Our sample also allows us to consider several bandwidths by including 150, 200, 250 and 300 stocks on each side of the cutoff separately.[21] We expect the effect of the "local" exogenous shock to ETF ownership to decrease as we increase the bandwidths. We augment Equation (3) by instrumenting ETF ownership with the instrument variable, $Switched_{i,t}$, in our two-stage least squares regression model. We also include all control variables used in Equation (3). In the first stage, we predict ETF ownership in the third quarter[22] with $Switched_{i,t}$, including industry fixed effects (h_j)

[18] One potential caveat is that managers could hold more cash for precautionary motives related to future investment opportunities rather than higher risk. In other words, managers may hold more cash if they view higher ETF ownership as a signal for better future investment opportunities. In our untabulated results, we substitute the dependent variable with future scaled R&D, scaled CAPX and scaled NWC and find no association between ETF ownership and future investment opportunities. Hence, we rule out the "precautionary motive related to future investment opportunities" explanation.

[19] We also show that ETF ownership induces a higher precautionary cash level due to potential risk (Section 4.1 documents detailed empirical tests). In particular, if managers believe that it is prudent to increase cash levels due to the likely systematic risk and non-fundamental volatility of ETFs (Ben-David et al., 2018; Da & Shive, 2018; Pagano et al., 2019), we should see managers hold more cash especially when firms are in financial deficit because they are in a weaker position to mitigate systematic risk (Denis & Sibilkov, 2009). Thus, we partition our sample into financially constrained and financially unconstrained firms using the following two measures: (1) the WW index (Whited & Wu, 2006) and (2) the SA index (Hadlock & Pierce, 2010). Our untabulated results show that higher ETF ownership induces managers to hold more cash when firms are financially constrained, further strengthening the interpretation that cash holdings arise from precautionary motives related to future systematic risk.

[20] Since Russell implemented a new assignment regime (upper and lower banding (+/−2.5%) around the 1000th cutoff) after 2007, we also check our IV results (cash level and beta) for the period 2000–2006 in the Internet Appendix for robustness, revealing qualitatively similar findings to the results for the full sample period.

[21] These selected bandwidths are consistent with those used in other literature. For example, Appel et al. (2016) adopt a bandwidth of 250 around the cutoff (1000th), and Ben-David et al. (2018) adopt bandwidths ranging from 100 to 500 around the cutoff (1000th).

[22] We choose to use ETF ownership in quarters two to four because the Russell reconstitution occurs in June every year. Overall, the predictions of ETF ownership in quarters two to four are consistent. We present the results using ETF ownership in the third quarter in the paper.

and year fixed effects (δ_t), as shown below:

$$ETF\ ownership_{i,t} = \alpha + \beta_1 * Switched_{i,t} + \sum_k \beta_k Controls + h_j + \delta_t + \varepsilon_{i,t} \quad (4)$$

In the second stage, we regress cash holdings in the fourth quarter on the fitted value of ETF ownership from the first stage, including industry fixed effects (h_j) and year fixed effects (δ_t), as shown below:

$$Cash\ level = \beta_1\ ETF\ \widehat{ownership}_{i,t} + \sum_k \beta_k Controls + h_j + \delta_t + u_{i,t} \quad (5)$$

Table 3 reports estimates from the instrument variable model developed based on the reconstitution of the Russell 1000 and Russell 2000 indexes. Panel A shows the first-stage results in which the dependent variable in Columns (1) to (4) and the dependent variable in Columns (5) to (8) are ETF ownership measured by ETF_{ILS} and ETF_{BFM}, respectively. Consistent with the literature (Ben-David et al., 2018), we find that the estimated coefficient of the instrument $Switched_{i,t}$ is significantly positive in all columns (as shown by the *t* statistics and *F* statistics), which confirms the relevance criterion for a good instrument variable.

Panel B presents the second-stage results where the dependent variable is the cash level. In Columns (1) to (4) and Columns (5) to (8), we consider different bandwidths (150, 200, 250 and 300) and use ETF_{ILS} and ETF_{BFM} as the main explanatory variables, respectively. The coefficient estimates are statistically significant across all bandwidths, with a coefficient range from 5.784 to 11.526. Similar to Ben-David et al. (2018), we notice that the magnitude of the IV estimates is larger than the OLS estimates in Table 3. This is because the estimated IV coefficients reflect a local average treatment effect (Angrist & Imbens, 1995); that is the IV estimates capture the effect of ETF ownership on the cash holdings only because of the index switch. As the bandwidth becomes wider, the magnitudes of the IV estimates decline. Therefore, firms that see drastic changes in their index status and ETF ownership show a greater impact on the level of cash holdings than the average firm. Overall, our results are consistent with the findings that higher ETF ownership leads firms to hold more cash.

3.3 | The value of cash holdings

Thus far, we have shown a robust and positive relation between cash holdings and ETF ownership and ruled out the H2 "*agency (indirect monitoring)" hypothesis* and the H3 "*liquidity substitution" hypothesis*; however, we still need to distinguish whether the H1 *"precautionary" hypothesis* or the H2 "*agency (weak monitoring)" hypothesis* is at work. According to the *precautionary cash hypothesis*, managers save corporate cash to hedge for future funding needs and to buffer adverse cash flow shocks due to costlier external equity financing. Thus, holding more cash as a precautionary strategy increases the value of cash (Faulkender & Wang, 2006; Han & Qiu, 2007). In contrast, according to the *agency (weak monitoring) hypothesis*, managers hoard more cash for personal interests (agency problem) because ETFs attract noise traders who are unlikely to monitor managers (Callen & Fang, 2013; Dasgupta & Piacentino, 2015; Jensen & Meckling, 1976; Chen et al., 2007; Levit, 2018; Dong et al., 2021; Schmidt & Fahlenbrach, 2017). Consequently, the value of cash holdings decreases significantly (Dittmar & Mahrt-Smith, 2007; Pinkowitz et al., 2006).

Therefore, to differentiate between the two hypotheses and to obtain a better understanding of what drives the positive relation between ETF ownership and cash holdings, we examine the influence of ETF ownership on the value of cash to shareholders. On the one hand, the *precautionary cash hypothesis* predicts that the value of cash is increasing if holding cash is done as a precautionary strategy (Faulkender & Wang, 2006; Han & Qiu, 2007), thereby benefitting shareholders. On the other hand, the *agency (weak monitoring) hypothesis* predicts that the value of cash is decreasing if holding cash is done for personal interests (Dittmar & Mahrt-Smith, 2007; Pinkowitz et al., 2006), thereby decreasing shareholders' wealth.

TABLE 3 Russell index reconstitution: ETF ownership and the level of cash holdings.

Panel A: First-stage regression								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	band150	band200	band250	band300	band150	band200	band250	band300
VARIABLES	ETF_{ILS}				ETF_{BFM}			
Switched	0.003***	0.003***	0.003***	0.004***	0.002***	0.003***	0.004***	0.004***
	(7.36)	(8.27)	(9.50)	(10.39)	(5.95)	(7.49)	(8.81)	(9.75)
Size ($t-1$)	−0.001**	−0.002***	−0.002***	−0.002***	−0.001*	−0.001***	−0.002***	−0.002***
	(−2.16)	(−3.56)	(−4.85)	(−5.74)	(−1.89)	(−3.29)	(−4.23)	(−4.96)
Cashflow ($t-1$)	−0.000	−0.001*	−0.001**	−0.001**	−0.001*	−0.001**	−0.001**	−0.001**
	(−1.29)	(−1.78)	(−1.97)	(−2.04)	(−1.65)	(−2.05)	(−2.26)	(−2.27)
Net working capital ($t-1$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.18)	(0.54)	(0.57)	(0.07)	(0.47)	(1.06)	(1.18)	(0.69)
Market-to-book ratio ($t-1$)	−0.000	−0.000**	−0.000**	−0.000***	−0.000**	−0.000***	−0.000***	−0.000***
	(−1.63)	(−2.32)	(−2.57)	(−2.79)	(−2.10)	(−2.88)	(−3.20)	(−3.32)
R&D expenditures ($t-1$)	−0.000	−0.002*	−0.002**	−0.001*	−0.000	−0.002*	−0.002**	−0.001*
	(−0.25)	(−1.87)	(−2.21)	(−1.84)	(−0.17)	(−1.88)	(−2.02)	(−1.68)
Acquisitions ($t-1$)	0.003	0.005*	0.004**	0.005**	0.004	0.005*	0.004*	0.005**
	(1.07)	(1.87)	(1.99)	(2.45)	(1.16)	(1.86)	(1.80)	(2.28)
Capital expenditures ($t-1$)	−0.002	−0.003	−0.004	−0.005	−0.000	−0.001	−0.003	−0.003
	(−0.45)	(−0.71)	(−1.18)	(−1.34)	(−0.00)	(−0.20)	(−0.77)	(−0.81)
Market leverage ($t-1$)	−0.005*	−0.002	−0.001	−0.001	−0.006**	−0.003	−0.002	−0.001
	(−1.92)	(−1.01)	(−0.57)	(−0.38)	(−2.28)	(−1.27)	(−0.94)	(−0.69)
Industry sigma ($t-1$)	−0.001**	−0.001**	−0.001***	−0.001***	−0.001**	−0.001**	−0.001***	−0.001***
	(−2.37)	(−2.53)	(−3.03)	(−3.84)	(−1.99)	(−2.15)	(−2.64)	(−3.43)

(Continues)

TABLE 3 (Continued)

Panel A: First-stage regression								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	band150	band200	band250	band300	band150	band200	band250	band300
VARIABLES	ETF_{ILS}				ETF_{BFM}			
Common dividend ($t-1$)	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(2.66)	(2.77)	(3.26)	(3.48)	(2.61)	(2.81)	(3.21)	(3.39)
Active fund ownership ($t-1$)	0.026***	0.027***	0.027***	0.025***	0.022***	0.023***	0.023***	0.022***
	(7.57)	(8.31)	(9.04)	(8.94)	(6.03)	(6.88)	(7.45)	(7.18)
Index fund ownership ($t-1$)	0.644***	0.644***	0.619***	0.625***	0.635***	0.636***	0.614***	0.623***
	(16.98)	(18.66)	(19.75)	(21.46)	(16.78)	(18.54)	(19.77)	(21.60)
Cragg–Donald Wald F statistic	28.546	39.146	59.693	77.431	23.896	36.197	55.298	76.736
Observations	3342	4467	5620	6724	3342	4467	5620	6724
Adjusted R-squared	0.826	0.824	0.824	0.822	0.805	0.803	0.802	0.799
Clustered S.E.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Industry F.E.	Y	Y	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y	Y	Y
Panel B: Second-stage regression								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	band150	band200	band250	band300	band150	band200	band250	band300
VARIABLES	Cash level				Cash level			
$\widehat{ETF_{ILS}}$	11.526***	10.806***	9.249***	6.221***				
	(2.60)	(2.99)	(3.30)	(2.68)				
$\widehat{ETF_{BFM}}$					12.676**	10.262***	8.544***	5.784***
					(2.55)	(3.03)	(3.32)	(2.70)

(Continues)

TABLE 3 (Continued)

Panel B: Second-stage regression								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	band150	band200	band250	band300	band150	band200	band250	band300
VARIABLES	Cash level				Cash level			
Size ($t-1$)	−0.147***	−0.134***	−0.124***	−0.124***	−0.147***	−0.136***	−0.127***	−0.126***
	(−10.44)	(−11.16)	(−10.86)	(−12.72)	(−10.29)	(−11.76)	(−11.87)	(−13.68)
Cashflow ($t-1$)	0.022	0.020	0.030*	0.033*	0.025	0.021	0.031*	0.033*
	(0.98)	(1.12)	(1.66)	(1.83)	(1.06)	(1.17)	(1.71)	(1.85)
Net working capital ($t-1$)	0.056***	0.082***	0.077***	0.086***	0.055**	0.081***	0.075***	0.085***
	(2.60)	(5.03)	(5.12)	(6.26)	(2.53)	(4.98)	(5.07)	(6.24)
Market-to-book ratio ($t-1$)	−0.000	−0.000	−0.000	−0.001	0.000	−0.000	−0.000	−0.001
	(−0.07)	(−0.30)	(−0.20)	(−0.42)	(0.07)	(−0.21)	(−0.13)	(−0.38)
R&D expenditures ($t-1$)	0.160***	0.102*	0.144***	0.139***	0.160***	0.102*	0.143***	0.138***
	(2.61)	(1.85)	(2.96)	(3.02)	(2.58)	(1.83)	(2.92)	(3.00)
Acquisitions ($t-1$)	−0.223***	−0.237***	−0.256***	−0.257***	−0.234***	−0.238***	−0.251***	−0.255***
	(−4.05)	(−5.00)	(−6.29)	(−7.63)	(−3.84)	(−5.00)	(−6.31)	(−7.68)
Capital expenditures ($t-1$)	−0.159	−0.097	−0.081	−0.077	−0.183	−0.120	−0.096	−0.089
	(−1.41)	(−1.02)	(−0.97)	(−1.10)	(−1.59)	(−1.29)	(−1.20)	(−1.30)
Market leverage ($t-1$)	0.267***	0.220***	0.174***	0.157***	0.286***	0.225***	0.181***	0.160***
	(4.82)	(4.92)	(4.53)	(4.94)	(4.66)	(5.08)	(4.80)	(5.10)
Industry sigma ($t-1$)	0.014*	0.011*	0.007	0.004	0.014*	0.010	0.006	0.003
	(1.79)	(1.73)	(1.23)	(0.88)	(1.67)	(1.57)	(1.05)	(0.73)
Common dividend ($t-1$)	−0.090***	−0.084***	−0.085***	−0.080***	−0.093***	−0.084***	−0.084***	−0.079***
	(−5.67)	(−6.14)	(−6.90)	(−7.60)	(−5.37)	(−6.22)	(−7.05)	(−7.75)
Active fund ownership ($t-1$)	−0.387***	−0.379***	−0.335***	−0.235***	−0.362***	−0.330***	−0.286***	−0.202***
	(−2.89)	(−3.35)	(−3.57)	(−3.11)	(−2.80)	(−3.33)	(−3.51)	(−3.08)

(Continues)

TABLE 3 (Continued)

Panel B: Second-stage regression								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	band150	band200	band250	band300	band150	band200	band250	band300
VARIABLES	Cash level				Cash level			
Index fund ownership ($t-1$)	−6.828**	−6.239***	−5.180***	−3.181**	−7.458**	−5.808***	−4.700***	−2.896**
	(−2.34)	(−2.60)	(−2.90)	(−2.15)	(−2.32)	(−2.61)	(−2.89)	(−2.12)
Observations	3342	4467	5620	6724	3342	4467	5620	6724
Adjusted R-squared	0.514	0.547	0.594	0.656	0.452	0.547	0.602	0.660
Clustered S.E.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Industry F.E.	Y	Y	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y	Y	Y

Note: This table reports estimates from the instrument variable model developed based on the reconstitution of the Russell 1000 and Russell 2000 indexes. Our sample covers firm–year observations from 2000 to 2021. Panel A shows the first-stage results, and the dependent variables are the two measures of ETF ownership (ETF_{ILS} and ETF_{BFM}) in the third quarter. The explanatory variable is our instrument variable, $Switched_{i,t}$. $Switched_{i,t}$ is a categorical variable that assumes a value of one if stock i belongs to the Russell 1000 index before index reconstitution but switches to the Russell 2000 index after index reconstitution in year t. Conversely, $Switched_{i,t}$ equals negative one if stock i belongs to the Russell 2000 index before index reconstitution but switches to the Russell 1000 index after index reconstitution in year t. Otherwise, $Switched_{i,t}$ equals zero. Columns (1) to (4) and (5) to (8) present bandwidths ranging from 150 to 300 stocks around the cutoff (1000th market capitalization). The control variables used in all panels are the same as those presented in Table 2. All ratio variables are winsorized at the 1st and 99th percentiles. All variable definitions are provided in the Appendix. Panel B presents the second-stage results where the dependent variable is the cash level, calculated as the natural logarithm of one plus the ratio of cash and cash equivalents to net assets. The main explanatory variable is instrumented ETF ownership. The instrument is $Switched_{i,t}$. The regression includes year fixed effects and industry fixed effects. The industries are defined by 2-digit SIC codes. The results are reported with firm-clustered standard errors. Robust t statistics are presented in parentheses. Cragg–Donald Wald F statistics for the weak identification test are also reported. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

To more precisely determine the value of cash holdings for firms with higher ETF ownership, we follow Faulkender and Wang (2006) and run an OLS regression of excess market returns on ETF ownership, the interaction between the change in cash holdings and ETF ownership, and various firm characteristics scaled by the past year's market capitalization. Our regression also includes year and industry fixed effects and firm-clustered standard errors. The regression is specified as follows:

$$\begin{aligned} r_{i,t} - R^{B}_{i,t} = {} & \beta_1 ETF\ ownership_{i,t} + \beta_2 ETF\ ownership_{i,t} * Change\ in\ cash\ ratio \\ & + \beta_3 Change\ in\ cash\ ratio + \beta_4 Change\ in\ earnings\ ratio \\ & + \beta_5 Change\ in\ net\ asset\ ratio + \beta_6 Change\ in\ R\&D\ ratio \\ & + \beta_7 Change\ in\ interest\ ratio + \beta_8 Change\ in\ dividend\ ratio \\ & + \beta_9 Lagged\ cash\ position + \beta_{10} Lagged\ leverage \\ & + \beta_{11} Net\ financing\ ratio + \beta_{12} Active\ fund\ ownership_{i,t} \\ & + \beta_{13} Index\ fund\ ownership_{i,t} + \beta_{14} Active\ fund\ ownership_{i,t} * Change\ in\ cash\ ratio \\ & + \beta_{15} Index\ fund\ ownership_{i,t} * Change\ in\ cash\ ratio \\ & + \beta_{15} Lagged\ cash\ position * Change\ in\ cash\ ratio \\ & + \beta_{16}\ Lagged\ leverage * Change\ in\ cash\ ratio \\ & + \gamma_i + \delta_t + \varepsilon_{i,t} \end{aligned} \tag{6}$$

The dependent variable is the value-weighted excess return, measured as the difference between firm *i*'s stock return over year *t*−1 to year *t*, ($r_{i,t}$) (computed using monthly returns from CRSP) and Fama and French's (1993) size and book-to-market matched portfolio return from year *t*−1 to year *t* ($R^{B}_{i,t}$).[23] The variable of interest is the interaction between ETF ownership (ETF_{ILS} and ETF_{BFM}) and the change in cash holdings (*ETF ownership*$_{i,t}$ * *Change in cash ratio*), and β_2 represents the effect of ETF ownership on the value of additional cash. We also include other control variables suggested by Faulkender and Wang (2006), including *Change in earnings ratio* ($\frac{\Delta E_{i,t}}{M_{i,t-1}}$), *Change in net asset ratio* ($\frac{\Delta NA_{i,t}}{M_{i,t-1}}$), *Change in R&D ratio* ($\frac{\Delta RD_{i,t}}{M_{i,t-1}}$), *Change in interest ratio* ($\frac{\Delta I_{i,t}}{M_{i,t-1}}$), *Change in dividend ratio* ($\frac{\Delta D_{i,t}}{M_{i,t-1}}$), *Lagged cash position* ($\frac{C_{i,t}}{M_{i,t-1}}$), *Lagged leverage* ($L_{i,t}$) and Net *financing ratio* ($\frac{NF_{i,t}}{M_{i,t-1}}$). Note that $M_{i,t-1}$ in the denominator of the controls is the prior year's market value of equity. We also include in our model active and index fund ownership (*Active fund ownership*$_{i,t}$; *Index fund ownership*$_{i,t}$), the interaction between them and the change in cash ratio (*Active fund ownership*$_{i,t}$ * *Change in cash ratio*; *Index fund ownership*$_{i,t}$ * *Change in cash ratio*) because we want to see the effect of active and index fund ownership on the value of additional cash. γ_i and δ_t capture firm and time fixed effects, respectively. The definitions of all of the variables are provided in the Appendix.

Table 4 reports estimated coefficients from regressions explaining the association between the value of cash holdings and ETF ownership, along with other control variables, where the dependent variable is stock *i*'s excess return. Column (1) reports the baseline results using the variables from Faulkender and Wang (2006) but excludes any ETF-related variables. Using the coefficient estimates from Column (1), an additional dollar of cash is valued by shareholders at $0.88. Our baseline result is consistent with the results of Faulkender and Wang (2006), who find that an additional dollar of cash increases shareholder wealth by $0.75.

[23] The benchmark portfolio is available on Professor Kenneth French's website https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

TABLE 4 ETF ownership and the value of cash holdings.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES				Excess return			
ETF_{ILS}		0.546***		0.528***	0.502***		
		(3.12)		(3.04)	(2.90)		
ETF_{ILS} *ΔC				2.138*	2.488**		
				(1.76)	−2.09		
ETF_{BFM}			0.484***			0.468***	0.434**
			(2.82)			(2.73)	(2.54)
ETF_{BFM}*ΔC						1.892*	2.023*
						(1.93)	(1.69)
ΔC	0.880***	0.880***	0.880***	0.847***	1.299***	0.852***	1.307***
	(24.84)	(24.83)	(24.84)	(20.15)	(20.57)	(20.42)	(20.75)
ΔE	0.483***	0.483***	0.483***	0.482***	0.476***	0.482***	0.477***
	(21.43)	(21.42)	(21.42)	(21.40)	(21.07)	(21.40)	(21.07)
ΔNA	0.201***	0.201***	0.201***	0.202***	0.207***	0.202***	0.207***
	(16.53)	(16.53)	(16.53)	(16.60)	(16.98)	(16.58)	(16.95)
ΔRD	0.953***	0.953***	0.953***	0.955***	0.898***	0.953***	0.896***
	(4.48)	(4.48)	(4.48)	(4.48)	(4.20)	(4.48)	(4.19)
ΔI	−1.655***	−1.657***	−1.657***	−1.664***	−1.563***	−1.661***	−1.560***
	(−6.01)	(−6.02)	(−6.02)	(−6.05)	(−5.74)	(−6.04)	(−5.73)
ΔD	1.595***	1.605***	1.603***	1.623***	1.572***	1.618***	1.566***
	(5.24)	(5.27)	(5.27)	(5.32)	(5.13)	(5.30)	(5.11)
Lagged cash position	0.222***	0.222***	0.222***	0.221***	0.192***	0.221***	0.192***
	(11.72)	(11.72)	(11.73)	(11.71)	(9.85)	(11.72)	(9.85)
Leverage	−0.404***	−0.404***	−0.404***	−0.404***	−0.393***	−0.403***	−0.393***
	(−26.76)	(−26.76)	(−26.72)	(−26.74)	(−26.36)	(−26.70)	(−26.33)
NF	−0.175***	−0.175***	−0.175***	−0.177***	−0.205***	−0.177***	−0.205***
	(−6.48)	(−6.49)	(−6.49)	(−6.55)	(−7.68)	(−6.56)	(−7.67)
Active fund ownership		0.060**	0.064**	0.060**	0.059**	0.064**	0.064**
		(2.22)	(2.41)	(2.24)	(2.22)	(2.42)	(2.42)
Index fund ownership		−0.307	−0.267	−0.312	−0.248	−0.270	−0.201
		(−1.46)	(−1.27)	(−1.48)	(−1.18)	(−1.28)	(−0.96)
Active fund ownership*ΔC				0.526	0.472	0.547	0.512
				(1.53)	(1.36)	(1.61)	(1.49)
Index fund ownership*ΔC				0.330	0.921	0.939	1.965
				(0.14)	(0.39)	(0.40)	(0.84)
C_{t-1}*ΔC					−0.520***		−0.523***
					(−5.84)		(−5.87)

(Continues)

TABLE 4 (Continued)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Excess return						
L*ΔC					−1.232***		−1.222***
					(−8.83)		(−8.75)
Observations	39,937	39,937	39,935	39,937	39,937	39,937	39,937
Adjusted R-squared	0.141	0.141	0.141	0.141	0.147	0.141	0.147
Clustered S.E.	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Industry F.E.	Y	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y	Y

Note: This table presents the estimated coefficients obtained from the regressions explaining the association between the value of cash holdings and ETF ownership. The dependent variable is excess returns, calculated as stock *i*'s returns from year *t*−1 to year *t* minus stock *i*'s benchmark portfolio returns from year *t*−1 to year *t*. The benchmark portfolios are 25 Fama–French value-weighted portfolios. The variable of interest is the interaction term between ETF ownership and the change in the cash ratio. We use two measures of ETF ownership (ETF_{ILS} and ETF_{BFM}). The other control variables include the change in the cash ratio, change in the earnings ratio, change in the net assets ratio, change in the R&D ratio, change in the interest ratio, change in the dividend ratio, lagged cash ratio, net financing ratio, interaction between the lagged cash ratio and change in cash ratio, interaction between leverage and change in the cash ratio, and active (index) fund ownership. All change variables are calculated as the difference in fundamentals from year *t*−1 to year *t* according to data from Compustat. All ratio variables are scaled by the lagged market equity (price in year *t*−1 multiplied by shares outstanding in year *t*−1). All variable definitions are provided in the Appendix. All regressions are estimated with firm-clustered standard errors. Robust *t* statistics are presented in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Then, we report "reduced form" regression results in Table 4 Columns (2) and (3) show a direct positive and significant association between ETF ownership and the value of cash. We find that an additional 1% increase in ETF_{ILS} (ETF_{BFM}) is valued by shareholders at \$0.55 (\$0.48). The reduced form regression results clearly show evidence of the positive value of cash from ETF ownership.

Furthermore, since our objective is to differentiate between the *precautionary cash hypothesis* and the *agency (weak monitoring) hypothesis*, we investigate whether the value of an additional dollar of cash increases or decreases with ETF ownership. To achieve this, we augment the specification in Column (1) with ETF ownership in Columns (4) to (7). We also consider the interaction effect of lagged cash position and leverage from Faulkender and Wang (2006) in Columns (5) and (7). Statistically, the estimated coefficients corresponding to the interaction of ETF ownership with the change in cash are positively significant at the 5%–10% level in Columns (4) to (7). Consistent with the *precautionary cash hypothesis*, these results indicate that the marginal value of cash increases with an increase in ETF ownership measured with both ETF_{ILS} and ETF_{BFM}.

Our results are also economically significant. For example, in Column (3), the value of an additional dollar of cash to shareholders in the mean firm is 113.58 cents.[24] A one-standard-deviation increase in ETF ownership increases the value of an additional dollar of cash by 6.94 cents (from 113.58 to 120.52 cents) or 6.11% for an average firm.[25] Similarly, in Column (5), the value of an additional dollar of cash to shareholders in the average firm is 116.75 cents.[26] A one-standard-deviation increase in ETF ownership increases the value of an additional dollar of cash by 5.57 cents (from 116.75 to 122.32 cents) or 4.77% for an average firm.[27]

[24] The value of 113.58 cents is calculated from $(1.299 + 2.488 \times 0.0261 + 0.472 \times 0.1870 + 0.921 \times 0.0269 - 0.520 \times 0.1815 - 1.232 \times 0.2001) \times 100$.

[25] Since one deviation of ETF_{ILS} is 2.79%, as shown in Table 1 Panel B, the value of 120.52 cents is calculated from $(1.299 + 2.488 \times (0.0279 + 0.0261) + 0.472 \times 0.1870 + 0.921 \times 0.0269 - 0.520 \times 0.1815 - 1.232 \times 0.2001) \times 100$.

[26] The value of 116.75 cents is calculated from $(1.307 + 2.023 \times 0.0254 + 0.512 \times 0.1870 + 1.965 \times 0.0269 - 0.523 \times 0.1815 - 1.222 \times 0.2001) \times 100$.

[27] Since one deviation of ETF_{BFM} is 2.75%, as shown in Table 1 Panel B, the value of 122.32 cents is calculated from $(1.307 + 2.023 \times (0.0275 + 0.0254) + 0.512 \times 0.1870 + 1.965 \times 0.0269 - 0.523 \times 0.1815 - 1.222 \times 0.2001) \times 100$.

Additionally, we directly test the association between ETF ownership and corporate governance and find further evidence to reject the *agency (weak monitoring) hypothesis*. Specifically, following Bebchuk et al. (2009) and Schmidt and Fahlenbrach (2017), we substitute the dependent variable in the baseline regression with ΔEindex (change in the entrenchment index from four quarters before *t* to *t*). Our untabulated results show no significant association between ETF ownership and corporate governance, further rejecting the *agency (weak monitoring) hypothesis*.[28]

Overall, our results show that the marginal value of cash increases with the amount of ETF ownership. These findings support the *precautionary cash hypothesis* that firms hold precautionary cash when higher ETF ownership induces additional firm risks and that shareholders place higher value on this type of precautionary cash. Given that our results in Column (1) without ETF ownership are very similar to those in Faulkender and Wang (2006), the positive effects of ETF ownership on the value of cash in Columns (2) to (5) are unlikely to be driven by different specifications or consideration of different sample periods but rather are likely to be driven by ETF ownership.

In summary, our test of the value of cash holdings rules out the *agency (weak or indirect monitoring) hypothesis* and further strengthens the support for the *precautionary cash hypothesis*.

3.4 | Sources of precautionary cash

To further understand the effects of precautionary motives on cash holdings, we follow the framework in McLean (2011) to examine how ETF ownership affects the cash savings rate for each source of capital. In particular, we regress the change in cash holdings on the interactions between ETF ownership and different sources of cash (equity issuance, debt issuance, internal cash flow and other sources), controlling for the sources of cash and ETF ownership (dummy). The regression is as follows:

$$\begin{aligned}\Delta Cash_{i,t} = {} & \beta_1 ETF\_Dum_{i,t} * Issue_{i,t} + \beta_2 ETF_{Dum_{i,t}} * Debt_{i,t} + \beta_3 ETF_{Dum_{i,t}} * Cashflow_{i,t} \\ & + \beta_4 ETF_{Dum_{i,t}} * Other_{i,t} + \beta_5 Issue_{i,t} + \beta_6 Debt_{i,t} + \beta_7 Cashflow_{i,t} + \beta_8 Other_{i,t} + \beta_9 ETF_{Dum_{i,t}} + \varepsilon_{i,t} \quad (7)\end{aligned}$$

The dependent variable is the change in cash holdings from quarter *t*−1 to *t*. For convenience of interpretation of the regression coefficients, we use two ETF ownership dummies calculated from ETF_{ILS} and ETF_{BFM}, respectively. The ETF ownership dummy ($ETF\_Dum_{i,t}$) takes a value of one (zero) if ETF ownership is above (below) the median in year–quarter *t*. We also include four sources of cash variables (*Issue*, *Debt*, *Cashflow* and *Other*). *Issue* is the ratio of the sale of common and preferred stock scaled to total assets. *Debt* is long-term debt issuance scaled by total assets. *Cashflow* is the ratio of cash flow (operating income before depreciation less interest and taxes) to net assets (total assets net of cash and cash equivalent). *Other* is the sum of sales of property, sales of investments and other sources of funds scaled by total assets. All variable definitions are provided in the Appendix. Following McLean (2011), our regressions are estimated using the Fama–Macbeth regression.

Table 5 shows the regression results of changes in cash on ETF ownership and the interaction of this variable with four different sources of cash defined above. Column (1) reports the baseline results using the sources of cash variables from McLean (2011). According to the coefficients from Column (1), on average, firms save 42.8 cents per dollar generated by equity issuances, 6.9 cents per dollar generated by debt issuances, 19.6 cents per dollar generated by internal cash flow and 2.2 cents per dollar generated by other sources. These baseline results are very similar to those reported in McLean (2011), in which the per dollar savings from each source are 43.4, 2.0, 28.1 and 7.0 cents, respectively.[29]

[28] The coefficient of ETF ownership is 0.395 with a *t*-statistic of 0.73. Hence, the association between ETF ownership and corporate governance is not statistically significant.

[29] The small differences between our results and McLean's (2011) may be due to the different time periods considered. McLean (2011) examines the period from 1971 to 2008. In addition, we define "Cashflow" as operating income before depreciation less interest and taxes scaled by net assets because we make the "Cashflow" variable definition the same as the variable definitions in other regression equations. However, McLean (2011) defines "Cashflow" as the sum

TABLE 5 ETF ownership, sources of financing and changes in cash holdings.

VARIABLES	(1)	(2) Changes in cash	(3)
Issue	0.428***	0.420***	0.422***
	(27.18)	(26.44)	(26.53)
Debt	0.069***	0.061***	0.062***
	(11.80)	(10.05)	(10.20)
Cashflow	0.196***	0.185***	0.185***
	(15.03)	(14.08)	(14.19)
Other	0.022***	0.029***	0.028***
	(4.39)	(4.50)	(4.39)
ETF_{ILS}_Dum*Issue		0.022*	
		(1.77)	
ETF_{ILS}_Dum*Debt		0.017***	
		(3.10)	
ETF_{ILS}_Dum*Cashflow		0.063***	
		(3.72)	
ETF_{ILS}_Dum*Other		−0.012*	
		(−1.82)	
ETF_{BFM}_Dum*Issue			0.013
			(0.86)
ETF_{BFM}_Dum*Debt			0.014**
			(2.18)
ETF_{BFM}_Dum*Cashflow			0.058***
			(3.42)
ETF_{BFM}_Dum*Other			−0.011*
			(−1.70)
ETF_{ILS}_Dum		0.001	
		(1.54)	
ETF_{BFM}_Dum			0.001*
			(1.93)
Observations	286,908	286,908	286,908
R-squared	0.355	0.362	0.363
Number of year–quarter	88	88	88
Fama–Macbeth	Y	Y	Y

Note: This table shows the estimated coefficients obtained from the regression explaining the association between ETF ownership, sources of financing and changes in cash. The dependent variable is $\Delta Cash_{i,t}$, which is the change in cash holdings from $t-1$ to t scaled by total assets. The variables of interest are the interaction terms between the ETF dummy and sources of cash. We use two ETF dummy variables in the regression: ETF_{ILS}_Dum takes a value of one (zero) if its ETF ownership (ETF_{ILS}) is above (below) the median in year–quarter t; and ETF_{BFM}_Dum takes a value of one (zero) if its ETF ownership (ETF_{BFM}) is above (below) the median in year–quarter t. We include four sources of cash variables (issue, debt, cash flow and other). Issue is the sales of common and preferred stocks scaled by total assets. Debt is long-term debt issuances scaled by total assets. Cashflow is the sum of income before extraordinary assets and depreciation scaled by total assets. Other is the sum of the sales of property, investments and other sources of funds scaled by total assets. All variable definitions are provided in the Appendix. All regressions are estimated using Fama–Macbeth regression. Robust t statistics are presented in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

We then investigate whether ETF ownership affects cash savings, conditioning upon each source of capital in Columns (2) and (3). First, we find that the interaction between the ETF_{ILS} ownership dummy and cash flow and the interaction between the ETF ownership dummy and debt issuances are positively significant at the 1% level. For example, the result in Column (2) shows that firms with high ETF ownership save 6.3 cents per dollar (1.7 cents per dollar) more from internal cash flow (debt issuance) than firms with low ETF ownership. Moreover, firms with higher ETF ownership tend to save more from internal cashflow than debt since the coefficients on the interaction between the ETF ownership dummy and cash flow are significantly greater than the coefficients on the interaction between the ETF ownership dummy and debt issuance.

In addition, we find a negative coefficient on the interaction between ETF ownership and *Other*, which indicates that firms with high ETF ownership do not tend to increase their sales of property, investments or other resources to save cash. We also find a small positive coefficient of the interaction between ETF ownership and equity issuances in Column (1) but not in Column (2). We consider that the economic magnitude of increasing cash savings conditional upon equity issuances is small because high ETF ownership increases savings by only 0.027 more from the base case of 0.417 and the relation is not robust. Column (3) tests robustness by substituting ETF_{ILS} with ETF_{BFM}, and our results remain similar. For instance, firms with high ETF ownership save 5.8 cents per dollar (1.4 cents per dollar) more from internal cash flow (debt issuance) than firms with low ETF ownership. Overall, our evidence suggests that firms with higher ETF ownership tend to save more cash from internal cash flows.

4 | CHANNEL TEST: PRECAUTIONARY MOTIVES

The *precautionary cash hypothesis* suggests that corporate managers hold more cash along with greater ETF ownership due to precautionary motives. In this section, we perform tests to further confirm the precautionary motives channel. In Section 4.1, we investigate whether ETFs induce greater comovement risk (Beta) at the firm level. Specifically, we examine whether and to what extent there is a positive relationship between ETF ownership and market risks (i.e. market beta). In Section 4.2, we conduct a cross-sectional test to examine whether the Beta is more likely to increase future expected crash risk (volatility) when ETF is high. In Section 4.1, we conduct a mediation test to examine whether cash holdings mitigate expected crash risk. In Section 4.2, we decompose ETF ownership into broad and sector and examine whether broad or sector ETF ownership contributes more to the increase in cash holdings.

4.1 | ETF ownership and market beta

According to the precautionary cash hypothesis, we expect to find that ETFs induce greater risk of stock return comovement, thereby leading firms to increase their precautionary cash holdings. To formally test whether ETFs increase firm-level risk of stock return comovement, we regress the market beta of the stock on ETF ownership along with the common control variables used in the cash holding analysis through the OLS regression and the Russell index reconstitution IV design.[30]

of income before extraordinary assets and depreciation scaled by total assets. We also run our tests using McLean's (2011) variable definition; the untabulated results are qualitatively similar. Specifically, on average, firms save 42.5 cents per dollar generated by equity issuances, 7.2 cents per dollar generated by debt issuances, 21.1 cents per dollar generated by internal cash flow and 2.1 cents per dollar generated by other sources.

[30] We have taken cues from the work of Da and Shive (2018), who have demonstrated the correlation between ETF ownership and return comovement at both fund and stock levels. They have used the CAPM beta as a proxy for stock return comovement at the stock level and have noted that arbitrageurs contribute to stock comovement through ETF arbitrage. Empirically, they have defined a "super-portfolio" by identifying all ETFs that hold a stock and have computed a natural measure of stock return comovement as the stock's beta with respect to its "super-portfolio" using daily excess returns in that month. However, for the following two reasons, they have focused on a stock's CAPM beta instead of the "super-portfolio" beta: first, the high correlation coefficient of 0.9 between these two betas and, second, the widespread use of the CAPM beta as the standard measure in the return comovement literature and other applications. Building on their empirical tests and reasoning, we firmly believe that our measurement of "Beta" reflects the best practice for capturing stock comovement.

Table 6 shows the regression results of ETF ownership and market beta.[31] We examine the relationship between ETF ownership and market beta along with the same control variables[32] used in Equation (3) using the OLS regression and the Russell index reconstitution IV design in Panels A and B, respectively. The dependent variable is the quarterly CAPM beta, estimated with weekly returns in the current quarter. In Panel A, we find a positive relationship between ETF ownership and market beta after including firm and year–quarter fixed effects. Economically, a one-standard-deviation increase in ETF ownership is related to an increase of 11.17% (with ETF_{ILS}) or 10.90% (with ETF_{BFM}) from the unconditional mean of market beta.[33]

In Panel B, similarly to Section 3.2, our IV model considers several bandwidths by including 150, 200, 250 and 300 stocks on each side of the cutoff separately. In the unreported first-stage results, we continue to find that the IV, $Switched_{i,t}$, highly positively predicts firm *i*'s ETF ownership in the third quarter in year *t*. We regress market beta in the fourth quarter in year *t* on the instrumented ETF ownership in the third quarter in year *t*. Consistent with our OLS results in Panel A, we find that the coefficients of ETF ownership are significantly positive at the 1% significance level in all columns, with a range from 25.91 to 76.66, suggesting that an increase in ETF ownership is associated with higher market risk.

To ensure the robustness of our results in Panel A, we use the following two alternative methods to construct our dependent variable (Beta) in Panel C: (1) the Fama–French 3-factor model (with the market, size and volume factors) and (2) the 4-factor model (with the market, size, volume and momentum factors) (Fama & French, 1992, 1995). The results in Panel C show that the association between ETF ownership and Beta remains positive and the relationship is statistically significant at the 1% level. For example, in Column (1), a one-standard-deviation increase in ETF ownership is related to a 6.21% increase in the market beta. Overall, our results show that ETF ownership induces a higher risk of stock return comovement in the equity market.

In this study, we also aim to investigate the mechanism through which ETF ownership influences cash holdings. To achieve this, we conduct a mediation analysis to examine the role of beta as a mediator in the relationship between ETF and cash holdings. Our findings suggest that beta partially mediates the relationship between ETF and cash holdings. Table 6 Panel D shows our mediation test results. Column (1) shows the direct path whereby ETF ownership positively and significantly influences cash holdings; Column (2) shows that the association between the mediator and cash holdings is statistically positive; Column (3) shows that including beta in the regression reduces the impact of ETF on cash holdings, with a significant decline of 0.035 (from 0.451 to 0.416) in the coefficient of ETF. Our results suggest that beta partially mediates the relationship between ETF and cash holdings. The Sobel (1982) test further resonates with this finding (indirect effect estimator = 0.040; $p < 0.001$). Substituting ETF with a different measure produced similar results in Columns (4) to (6).

4.2 | Broad versus sector ETF ownership

ETFs can be decomposed into at least two different groups, namely, broad and sector ETFs. Broad ETFs, such as SPY (S&P 500 SPDR Trust ETF) and IVV (iShares Core S&P 500 ETF), have greater assets under management and heterogeneous constituents. Sector ETFs, such as XBI (SPDR S&P Biotech ETF) and XLV (Health Care Select Sector SPDR Fund), have greater turnover and consist of homogeneous securities in a similar industry. Recent literature finds that the different types of ETFs play different roles in information transfer, which can affect market participants and corporate managers differently. For example, Bhojraj et al. (2020) find that broad ETFs are associated with decreased

[31] We have also replicated the empirical tests of Ben-David et al. (2018) by using stock return volatility as a dependent variable. The results are similar. In addition, Da and Shive (2018) argue that using Beta is the best practice to proxy for stock comovement.

[32] We have also performed the regression with the beta determinants from Hong and Sarkar (2007) in Table IA-3 and find consistent results.

[33] The calculations of economic significance for the ETF_{ILS} and ETF_{BFM} measures are as follows: 11.17% = 3.363*0.0278/0.8188 and 10.90% = 3.221 *0.0283/0.8188, respectively. Please note that all decimal places are kept in all interim calculations, but we reduce the decimal places in the presentation.

TABLE 6 ETF ownership and beta.

Panel A: ETF ownership and beta				
	(1)	(2)	(3)	(4)
VARIABLES	Beta			
ETF_{ILS} ($t-1$)	3.363***	4.211***		
	(16.87)	(13.86)		
ETF_{BFM} ($t-1$)			3.221***	3.954***
			(18.29)	(16.58)
Size ($t-1$)	0.092***	0.070***	0.092***	0.069***
	(12.76)	(8.74)	(12.83)	(8.70)
Cashflow ($t-1$)	0.039***	0.044***	0.039***	0.044***
	(3.40)	(3.67)	(3.39)	(3.66)
Net working capital ($t-1$)	0.015***	0.015***	0.015***	0.015***
	(5.53)	(4.57)	(5.57)	(4.58)
Market-to-book ratio ($t-1$)	0.003***	0.003***	0.003***	0.003***
	(10.85)	(10.42)	(10.83)	(10.37)
R&D expenditures ($t-1$)	−0.028	−0.065**	−0.028	−0.065**
	(−0.99)	(−2.03)	(−0.99)	(−2.04)
Acquisitions ($t-1$)	0.006	0.006	0.004	0.006
	(0.16)	(0.16)	(0.10)	(0.16)
Capital expenditures ($t-1$)	0.399***	0.430***	0.398***	0.424***
	(7.43)	(7.40)	(7.42)	(7.30)
Market leverage ($t-1$)	−0.027	0.050*	−0.026	0.054*
	(−1.01)	(1.68)	(−0.96)	(1.81)

(Continues)

TABLE 6 (Continued)

Panel A: ETF ownership and beta				
	(1)	(2)	(3)	(4)
VARIABLES		Beta		
Industry sigma ($t-1$)	−0.016	−0.012	−0.017	−0.012
	(−1.43)	(−0.94)	(−1.48)	(−1.00)
Common dividend ($t-1$)	−0.060***	−0.060***	−0.060***	−0.060***
	(−6.39)	(−5.90)	(−6.41)	(−5.94)
Active fund ownership ($t-1$)		0.205***		0.226***
		(4.72)		(5.20)
Index fund ownership ($t-1$)		−1.205**		−1.062**
		(−2.31)		(−2.32)
Observations	178,823	147,231	178,823	147,231
Adjusted R-squared	0.358	0.352	0.358	0.353
Clustered S.E.	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y

Panel B: Russell index reconstitution—ETF ownership and beta (second-stage regression)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	band150	band200	band250	band300	band150	band200	band250	band300
VARIABLES		Beta				Beta		
$\widehat{ETF}_{ILS}$	69.795***	50.558***	33.844***	27.509***				
	(3.89)	(4.13)	(4.09)	(4.17)				
$\widehat{ETF}_{BFM}$					76.663***	49.055***	31.753***	25.913***
					(3.44)	(3.89)	(3.96)	(4.10)

(Continues)

TABLE 6 (Continued)

Panel B: Russell index reconstitution—ETF ownership and beta (second-stage regression)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	band150	band200	band250	band300	band150	band200	band250	band300
VARIABLES	Beta				Beta			
Size ($t-1$)	−0.022	−0.030	−0.043*	−0.054***	−0.027	−0.039	−0.052**	−0.062***
	(−0.53)	(−0.99)	(−1.81)	(−2.71)	(−0.62)	(−1.32)	(−2.32)	(−3.29)
Cashflow ($t-1$)	0.040	0.039*	0.033	0.037*	0.044	0.041*	0.035*	0.038**
	(1.47)	(1.67)	(1.58)	(1.93)	(1.62)	(1.86)	(1.74)	(2.05)
Net working capital ($t-1$)	0.015	−0.006	−0.007	−0.006	0.006	−0.014	-0.013	−0.010
	(0.55)	(−0.34)	(−0.47)	(−0.43)	(0.23)	(−0.80)	(−0.86)	(−0.72)
Market-to-book ratio ($t-1$)	0.005**	0.003**	0.003**	0.003***	0.006***	0.004***	0.003***	0.003***
	(2.52)	(2.53)	(2.40)	(2.68)	(2.91)	(3.02)	(2.75)	(2.90)
R&D expenditures ($t-1$)	−0.058	0.063	0.044	0.052	−0.051	0.060	0.039	0.047
	(−0.58)	(0.89)	(0.77)	(1.04)	(−0.48)	(0.90)	(0.71)	(0.98)
Acquisitions ($t-1$)	−0.147	−0.102	−0.081	−0.127	−0.173	−0.107	−0.071	−0.118
	(−0.63)	(−0.60)	(−0.65)	(−1.18)	(−0.64)	(−0.61)	(−0.57)	(−1.10)
Capital expenditures ($t-1$)	1.087***	1.033***	0.879***	0.678***	0.944**	0.938***	0.839***	0.632***
	(2.82)	(3.62)	(3.81)	(3.43)	(2.26)	(3.30)	(3.77)	(3.29)
Market leverage ($t-1$)	0.815***	0.679***	0.618***	0.634***	0.900***	0.707***	0.632***	0.640***
	(3.88)	(4.71)	(5.77)	(7.02)	(3.83)	(4.92)	(5.99)	(7.15)
Industry sigma ($t-1$)	0.057*	0.037	0.021	0.018	0.046	0.028	0.017	0.016
	(1.66)	(1.59)	(1.31)	(1.32)	(1.20)	(1.22)	(1.05)	(1.14)

(Continues)

TABLE 6 (Continued)

Panel B: Russell index reconstitution—ETF ownership and beta (second-stage regression)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	band150	band200	band250	band300	band150	band200	band250	band300
VARIABLES	Beta				Beta			
Common dividend ($t-1$)	−0.228***	−0.187***	−0.157***	−0.144***	−0.259***	−0.197***	−0.159***	−0.144***
	(−3.37)	(−3.95)	(−4.58)	(−4.96)	(−3.20)	(−3.93)	(−4.59)	(−4.98)
Active fund ownership ($t-1$)	−1.717***	−1.385***	−0.973***	−0.711***	−1.579***	−1.195***	−0.812***	−0.582***
	(−3.11)	(−3.52)	(−3.64)	(−3.41)	(−2.71)	(−3.25)	(−3.39)	(−3.13)
Index fund ownership ($t-1$)	−44.199***	−31.638***	−20.503***	−16.682***	−48.250***	−30.476***	−19.190***	−15.734***
	(−3.81)	(−3.97)	(−4.00)	(−4.02)	(−3.38)	(−3.74)	(−3.87)	(−3.95)
Observations	3047	4092	5137	6169	3047	4092	5137	6169
Clustered S.E.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Industry F.E.	Y	Y	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y	Y	Y

(Continues)

TABLE 6 (Continued)

Panel C: Robustness checks using 3 factors or 4 factors to construct Beta								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Beta (3 factors)				Beta (4 factors)			
ETF_{ILS} ($t-1$)	1.967***	2.549***			2.408***	3.089***		
	(10.89)	(10.07)			(13.29)	(12.45)		
ETF_{BFM} ($t-1$)			2.080***	2.643***			2.387***	2.965***
			(12.61)	(12.15)			(14.67)	(14.25)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Active/Index fund controls	N	Y	N	Y	N	Y	N	Y
Observations	178,823	147,231	178,823	147,231	178,823	147,231	178,823	147,231
Adjusted R-squared	0.238	0.236	0.238	0.237	0.202	0.192	0.202	0.193
Firm F.E.	Y	Y	Y	Y	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y	Y	Y	Y	Y

(Continues)

TABLE 6 (Continued)

Panel D: Mediation test: mediation effect from Beta						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Ln(1+Cash/Asset)	Ln(1+Cash/Asset)	Ln(1+Cash/Asset)	Ln(1+Cash/Asset)	Ln(1+Cash/Asset)	Ln(1+Cash/Asset)
ETF_{ILS} ($t-1$)	0.451***		0.416***			
	(5.47)		(5.03)			
ETF_{BFM} ($t-1$)				0.399***		0.365***
				(5.70)		(5.21)
Beta		0.012***	0.011***		0.012***	0.011***
		(10.92)	(9.35)		(10.92)	(9.36)
Observations	185,002	217,571	184,970	184,980	217,571	184,948
Adjusted R-squared	0.440	0.452	0.441	0.440	0.452	0.441
Controls	Y	Y	Y	Y	Y	Y
Firm F.E.	Y	Y	Y	Y	Y	Y
Year-quarter F.E.	Y	Y	Y	Y	Y	Y

Note: This table presents the estimated coefficients from the regressions explaining the association between beta and ETF ownership along with the other control variables. Our sample covers the 2000–2021 period. Panel A shows the OLS regression results. The dependent variable is the quarterly beta, estimated with weekly returns in the current quarter. For the main explanatory variable, we include the following two measures of ETF ownership: (1) ETF_{ILS} is calculated as the percentage of firm *i*'s common shares outstanding held by ETFs at the end of each quarter, and (2) ETF_{BFM} is calculated as the sum of ownership of all ETFs holding stock *i* at the end of each quarter. Columns (1) and (2) and Columns (3) and (4) report the results obtained using ETF ownership from ETF_{ILS} and ETF_{BFM}, respectively. All independent variables are measured in the last quarter ($t-1$). Panel B shows the second-stage results from the instrument variable model developed based on the reconstitution of the Russell 1000 and Russell 2000 indexes, and the dependent variable is beta in the fourth quarter. The explanatory variable is instrumented ETF ownership (the instrument variable is $Switched_{i,t}$). $Switched_{i,t}$ is a categorical variable that assumes a value of one if stock *i* belongs to the Russell 1000 index before index reconstitution but switches to the Russell 2000 index after index reconstitution in year *t*. Conversely, $Switched_{i,t}$ equals negative one if stock *i* belongs to the Russell 2000 index before index reconstitution but switches to the Russell 1000 index after index reconstitution in year *t*. Otherwise, $Switched_{i,t}$ equals zero. Columns (1) to (4) and (5) to (8) present bandwidths ranging from 150 to 300 stocks around the cutoff (1000th market capitalization). The controls used in all panels are the same as those presented in Table 2. To check robustness, we use the following two alternative methods to construct our dependent variable (Beta) in Panel C: (1) the Fama–French 3-factor model (with the market, size and volume factors) and (2) the 4-factor model (with the market, size, volume and momentum factors) (Fama & French, 1992, 1995). All ratio variables are winsorized at the 1st and 99th percentiles. Panel D documents the mediation test. Columns (1) and (4) show the regression results of the direct path whereby ETF influences cash holdings; Columns (2) and (5) show the association between the mediator (beta) and cash holdings; and Columns (3) and (6) show the regression results by including both ETF and the mediator. All variable definitions are provided in the Appendix. The industries are defined by the 2-digit SIC codes. Robust *t* statistics are presented in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

earnings response coefficients and lower responsiveness to industry and idiosyncratic information. Since broad ETFs reduce the information efficiency of stock prices that further aggravate the prospects for rises in the cost of external financing, we expect that the positive relationship between ETF ownership and cash holdings is driven mainly by broad ETFs. Particularly, we examine whether and to what extent corporate managers react more to broad ETF ownership than to sector ETF ownership by increasing precautionary cash holdings.

Following Bhojraj et al. (2020), we classify ETFs as broad or sector by analyzing the names of the ETFs. Specifically, we manually search the ETF names using Yahoo Finance and ETFdb.com to identify whether the ETFs focus on specific sectors or follow broad market indexes. Out of 548 ETFs, we identify 291 broad ETFs and 257 sector ETFs and then construct firms' broad ETF ownership and sector ETF ownership accordingly. The average of broad ETF ownership is 2.34% for ETF_{ILS} and 2.27% for ETF_{BFM}, while the average of sector ETF ownership is 0.23% for ETF_{ILS} and 0.25% for ETF_{BFM}. We then rerun the regression in Equation (3) by replacing ETF ownership with broad and sector ETF ownership.

Table 7 presents the regression results of cash holdings on broad and sector ETF ownership. To facilitate the comparison of the impact of broad and sector ETF ownership on cash holdings, we standardize both broad and sector ETF ownership to have a mean of 0 and a standard deviation of 1, respectively. Statistically, we find that the coefficients on both broad and sector ETF ownership are positively significant in all columns. However, broad ETF ownership has a much more substantial economic impact than sector ETF ownership on cash holdings (i.e. triple the impact). For example, in Column (1), the results indicate that a one-standard-deviation increase in broad (sector) ETF ownership is positively associated with an increase of 3.44% (0.82%) from the mean cash level (0.3521). All other columns have similar economic significance patterns.[34]

5 | FURTHER EXTENSIONS

5.1 | Alternative excess cash holding measure

Our baseline regression model adopts various scaled cash levels as dependent variables and shows that ETF ownership drives more cash holdings, but a high cash level may be driven by other unobservable factors. We thus shift our attention to examine the effect of excess cash level on ETF ownership for the following two reasons. First, excess cash captures abnormal cash reserves (Bates et al., 2009, 2018). If the precautionary motive explains the positive association between ETF ownership and cash holdings, managers should maintain a more-than-abnormal cash reserve level for precautionary purposes. Second. excess cash has the potential to capture firms' future abnormal stock risk and return (Simutin, 2010). If higher ETF ownership drives higher abnormal cash holdings, it can also strengthen the precautionary motive due to higher future risk potential.

To formally test the excess cash level, we follow Harford et al. (2008), Asem and Alam (2014), and Huang and Mazouz (2018) and construct the normal cash level at quarter level:

$$\begin{aligned} Norm\,Cash_i = {} & \beta_0 + \beta_1 \frac{FCF_i}{NA_i} + \beta_2 L_i + \beta_3 \frac{MV_i}{NA_i} + \beta_4 Ln(NA_i) + \beta_5 \frac{NWC_i}{NA_i} + \beta_6 \frac{CAPX_i}{NA_i} \\ & + \beta_7 Dividends_i + \beta_8 \frac{RD_i}{NA_i} + \beta_9 REG_i + \beta_{10}\,(Industry\ Sigma_i) + \varepsilon_i \end{aligned} \tag{8}$$

The dependent variable, $Norm\ Cash_i$, is measured as the difference between the log of cash and short-term investment scaled by net assets. Cash level determinants include *cashflow* ($\frac{FCF_i}{NA_i}$), *leverage* (L_i), *size* ($Ln(NA_i)$), *market-to-book*

[34] In Column (2), the economic significance for broad (sector) is 2.52% (0.97%). In Column (3), the economic significance for broad (sector) is 3.14% (0.99%). In Column (4), the economic significance for broad (sector) is 2.25% (1.13%).

TABLE 7 Broad versus sector ETF ownership and the level of cash holdings.

	(1)	(2)	(3)	(4)
VARIABLES		Cash level		
Broad_ETF$_{ILS}$ ($t-1$)	0.458***	0.335***		
	(4.51)	(2.98)		
Sector_ETF$_{ILS}$ ($t-1$)	0.538*	0.632**		
	(1.84)	(2.04)		
Broad_ETF$_{BFM}$ ($t-1$)			0.418***	0.298***
			(4.69)	(3.10)
Sector_ETF$_{BFM}$ ($t-1$)			0.579**	0.660**
			(2.28)	(2.47)
Size ($t-1$)	−0.121***	−0.126***	−0.121***	−0.126***
	(−24.05)	(−24.44)	(−24.03)	(−24.42)
Cashflow ($t-1$)	0.049***	0.064***	0.049***	0.064***
	(4.22)	(6.12)	(4.22)	(6.11)
Net working capital ($t-1$)	0.072***	0.078***	0.072***	0.078***
	(13.43)	(21.64)	(13.43)	(21.65)
Market-to-book ratio ($t-1$)	0.000	0.000	0.000	0.000
	(1.44)	(0.79)	(1.44)	(0.79)
R&D expenditures ($t-1$)	0.109***	0.080***	0.109***	0.080***
	(4.01)	(2.87)	(4.01)	(2.88)
Acquisitions ($t-1$)	−0.092***	−0.094***	−0.093***	−0.094***
	(−7.63)	(−7.26)	(−7.63)	(−7.25)
Capital expenditures ($t-1$)	0.056**	0.020	0.056**	0.019
	(2.19)	(0.71)	(2.19)	(0.70)
Market leverage ($t-1$)	−0.040***	−0.020**	−0.040***	−0.020*
	(−4.42)	(−1.98)	(−4.40)	(−1.95)
Industry sigma ($t-1$)	0.004	0.002	0.003	0.002
	(0.93)	(0.53)	(0.89)	(0.52)
Common dividend ($t-1$)	0.006*	0.008**	0.006	0.008**
	(1.65)	(2.02)	(1.64)	(2.01)
Active fund ownership ($t-1$)		0.084***		0.086***
		(4.85)		(4.98)
Index fund ownership ($t-1$)		0.175**		0.189**
		(2.18)		(2.25)
Observations	178,823	147,231	178,823	147,231
Adjusted R-squared	0.915	0.920	0.915	0.920
Clustered S.E.	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y

Note: This table presents the estimated coefficients from regressions explaining the association between cash holdings and broad and sector ETF ownership along with other control variables. Our sample covers the 2000–2021 period. The dependent variable is the cash level. We decompose ETF ownership ETF$_{ILS}$ and ETF$_{BFM}$ into broad and sector. For better comparison, broad and sector ETF ownership are standardized. We regress the cash level on broad and sector ETF ownership. Columns (1) and (2) and Columns (3) and (4) report the results obtained using ETF ownership from ETF$_{ILS}$ and ETF$_{BFM}$, respectively. All independent variables are measured in the last quarter ($t-1$). All ratio variables are winsorized at the 1st and 99th percentiles. All variable definitions are provided in the Appendix. All regressions are estimated with firm and year–quarter fixed effects and firm-clustered standard errors. Robust t statistics are presented in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

ratio ($\frac{MV_i}{NA_i}$), *net working capital* ($\frac{NWC_i}{NA_i}$), *capital expenditure* ($\frac{CAPX_i}{NA_i}$), *payout to shareholders* ($Dividends_i$), *research and development expenses* ($\frac{RD_i}{NA_i}$), *regulated industry dummy*[35] (REG_i) and *industry sigma*. The residual value, ε_i, captures excess cash ($Ex\ Cash_i$).

Then, we replicate our baseline regression model and regress excess cash on ETF ownership. All other regression settings are the same as those in the baseline regression. The regression is specified as follows:

$$\begin{aligned} Excess\ cash_{i,t} = {} & \beta_1\ ETF\ ownership_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 Cashflow_{i,t-1} \\ & + \beta_4 Net\ working\ capital_{i,t-1} + \beta_5 Market\ to\ book\ ratio_{i,t-1} + \beta_6 R\&D\ expense_{i,t-1} \\ & + \beta_7 Acquisitions_{i,t-1} + \beta_8 Capital\ expenditures_{i,t-1} + \beta_9 Market\ leverage_{i,t-1} \\ & + \beta_{10} Industry\ sigma_{i,t-1} + \beta_{11} Common\ dividend_{i,t-1} \\ & + \beta_{12} Active\ fund\ ownership_{i,t-1} + \beta_{13} Index\ fund\ ownership_{i,t-1} \\ & + \gamma_i + \delta_t + \varepsilon_{i,t} \end{aligned} \tag{9}$$

The dependent variable is firm *i*'s excess cash level in quarter *t*, measured as the difference between the natural logarithm of cash to net assets and normal cash predicted from Equation (8). All other regression settings are the same as those of the baseline regression model.

Table 8 reports the regression of excess cash on ETF ownership shown in Equation (9). The results for the variables of interest measuring ETF ownership, ETF_{ILS} and ETF_{BFM}, are reported in Columns (1) and (2) and in Columns (3) and (4), respectively. The coefficients on ETF_{ILS} and ETF_{BFM} are significantly positive at the 1% level, suggesting that firms hold more cash when they experience higher ETF ownership. Specifically, when ETF ownership increases by 1%, the excess cash level increases by 3.07% and 2.10%. In Columns (2) and (4), we also control for active and index fund ownership. Columns (2) and (4) show that our regression results in Columns (1) and (3) are not affected by the addition of these investor ownership variables.

Economically, the results indicate that a one-standard-deviation change in ETF ownership is positively related to an increase of 36.27% (with ETF_{ILS}) or 31.70% (with ETF_{BFM}) from the mean of excess cash.[36] Given the mean cash level of 0.235, an increase in the cash level of 36.27% translates into a 43.72% increase from the mean of the cash ratio (23.50%). Opler et al. (1999) identify that cash flow is the most significant determinant of cash holdings. From this perspective, we can view ETF ownership as an economically significant determinant of excess cash.

In summary, our results further strengthen the *precautionary cash hypothesis*, which states that firms hold more precautionary cash in response to the higher risks induced by higher ETF ownership.

5.2 | Cross-sectional tests

To further confirm that a firm holds more precautionary cash to mitigate the anticipated risks associated with increasing ETF ownership, we perform subsample tests in which the precautionary motive for cash holdings is expected to be more pronounced. Specifically, we expect that the positive relation between ETF ownership and the value of cash holdings is more pronounced in (1) financially constrained firms and (2) firms with stronger shareholder monitoring.

[35] As per Barclay and Smith (1995), regulated industries are railroads (SIC code 4011), trucking (SIC code 4210 and 4213), airlines (SIC code 4512) and telecoms (SIC code 4812 and 4813).

[36] The calculations of economic significance for the ETF_{ILS} and ETF_{BFM} measures are as follows: 36.27% = 3.066 *0.0278/0.2350 and 31.70% = 2.097*0.0283/0.2350, respectively. Please note that all decimal places are kept in all interim calculations, but we reduce the decimal places in the presentation.

TABLE 8 Excess cash holdings and ETF ownership.

VARIABLES	(1)	(2)	(3)	(4)
	Excess cash			
ETF_{ILS} ($t-1$)	3.259***	2.507***		
	(6.48)	(4.56)		
ETF_{BFM} ($t-1$)			2.936***	2.353***
			(7.01)	(5.30)
Size ($t-1$)	−0.300***	−0.326***	−0.299***	−0.327***
	(−18.87)	(−19.03)	(−18.80)	(−19.05)
Cashflow ($t-1$)	0.014	0.005	0.014	0.005
	(0.89)	(0.35)	(0.90)	(0.35)
Net working capital ($t-1$)	−0.020***	−0.014**	−0.020***	−0.014**
	(−3.31)	(−2.15)	(−3.29)	(−2.16)
Market-to-book ratio ($t-1$)	−0.002***	−0.003***	−0.002***	−0.003***
	(−7.45)	(−8.28)	(−7.43)	(−8.30)
R&D expenditures ($t-1$)	−0.549***	−0.637***	−0.549***	−0.637***
	(−12.93)	(−14.81)	(−12.94)	(−14.84)
Acquisitions ($t-1$)	−0.560***	−0.637***	−0.562***	−0.637***
	(−7.95)	(−8.58)	(−7.96)	(−8.58)
Capital expenditures ($t-1$)	0.194**	0.123	0.195**	0.121
	(2.11)	(1.23)	(2.13)	(1.22)
Market leverage ($t-1$)	1.247***	1.355***	1.248***	1.359***
	(21.39)	(22.25)	(21.40)	(22.31)
Industry sigma ($t-1$)	−0.445***	−0.460***	−0.445***	−0.460***
	(−17.31)	(−17.45)	(−17.34)	(−17.45)
Common dividend ($t-1$)	0.236***	0.228***	0.236***	0.227***
	(10.29)	(9.20)	(10.27)	(9.16)
Active fund ownership ($t-1$)		0.344***		0.358***
		(4.23)		(4.42)
Index fund ownership ($t-1$)		1.164**		1.249**
		(2.39)		(2.50)
Observations	177,917	146,573	177,917	146,573
Adjusted R-squared	0.658	0.671	0.658	0.671
Clustered S.E.	Y	Y	Y	Y
Firm F.E.	Y	Y	Y	Y
Year–quarter F.E.	Y	Y	Y	Y

Note: This table presents the estimated coefficients from regressions explaining the association between excess cash holdings and ETF ownership along with other control variables. Our sample covers the 2000–2021 period. The dependent variable is the excess cash level, calculated as the difference between actual cash holdings and normal cash holdings (residual predicted by Model 8). For the main explanatory variable, we include the following two measures of ETF ownership: ETF_{ILS} is calculated as the percentage of firm *i*'s common shares outstanding held by ETFs at the end of each quarter, and ETF_{BFM} is calculated as the sum of ownership of all ETFs holding stock *i* at the end of each quarter. Columns (1) and (2) and Columns (3) and (4) report the results obtained using ETF ownership from ETF_{ILS} and ETF_{BFM}, respectively. Columns (1) and (3) are the baseline model from Opler et al. (1999). In Columns (2) and (4), we further control for active fund ownership and index fund ownership. Industries are defined by 2-digit SIC codes. All independent variables are measured in the last quarter ($t-1$). All ratio variables are winsorized at the 1st and 99th percentiles. All variable definitions are provided in the Appendix. All regressions are estimated with firm and year–quarter fixed effects and firm-clustered standard errors. Robust *t* statistics are presented in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

5.2.1 | Financially constrained versus unconstrained firms

Denis and Sibilkov (2009) show that cash holdings are more valuable for financially constrained firms because higher cash holdings allow financially constrained firms to undertake positive-value projects that might otherwise be foregone. Thus, we sort our sample into financially constrained and unconstrained firms using the following two measures: (1) the WW index (Whited & Wu, 2006) and (2) the SA index (Hadlock & Pierce, 2010). If a firm's financial constraint measure is above (or below) its median by year, we classify the firm as financially constrained (or unconstrained). We repeat the regression in Equation (6) in the subsamples and predict that the value of cash holdings in firms with higher ETF ownership will be higher when the firm is financially constrained. We also perform chi-square tests to evaluate the significance of differences in the coefficients on ETF ownership between subsamples.

Table 9 presents the estimated coefficients from regressions explaining the association between the value of cash holdings and ETF ownership across financially constrained and unconstrained firms. Our subsample results using the WW index and the SA index are reported in Columns (1) to (4) and Columns (5) to (8), respectively. We find that consistent with our prediction, the positive relation between the value of cash holdings and ETF ownership is more pronounced in financially constrained firms. For example, in the results based on the WW index, in Columns (1) and (2), the coefficients on the interaction between ETF ownership and the change in cash holdings are 4.62 and 4.99, which are positively significant at 5%. In contrast, in Columns (3) and (4), the coefficients on the interaction between ETF ownership and the change in cash holdings are −0.67 and −1.55, respectively, which are not statistically significant. The results based on the SA index in Columns (5) to (8) show a finding similar to those obtained with the WW index.

Specifically, the coefficients on the interaction between ETF ownership (measured by ETF_{ILS} and ETF_{BFM}) and the change in cash holdings are positive and statistically significant for financially constrained firms (Columns (5) and (6)) but not statistically significant for financially unconstrained firms (Columns (7) and (8)). Therefore, the findings confirm our precautionary cash hypothesis that financially constrained firms react more to the increase in anticipated risks and financial friction induced by ETF ownership and tend to hold more cash than financially unconstrained firms.[37]

5.2.2 | Strong versus weak shareholder monitoring

Dittmar and Mahrt-Smith (2007) find that the value of cash holdings is higher in firms with good internal governance, which can help shareholders defend against the inefficient use of internal resources by managers. Thus, to further rule out the *agency hypothesis*, we partition our sample into firms with strong and weak shareholder monitoring based on two measures: (1) the percentage holdings of dedicated institutional investors (e.g. Balakrishnan et al., 2018; Boone & White, 2015; Bushee, 1998; Callen & Fang, 2013) and (2) the number of blockholders (e.g. Ashbaugh-Skaife et al., 2006; Edmans, 2014; Edmans & Manso, 2010; Kang et al., 2018; Larcker et al., 2007; Noe, 2002). We classify a firm as one with strong (weak) shareholder monitoring if these two measures are above (below) their sample median in the year. We repeat the regression in Equation (6) for these subsamples and predict that the positive association between the value of cash holdings and ETF ownership is stronger in firms with stronger shareholder monitoring. We also perform chi-square tests to evaluate the significance of the differences in the coefficients on ETF ownership between the subsamples.

Table 10 presents the estimated coefficients from regressions explaining the association between the value of cash holdings and ETF ownership across firms with both strong and weak shareholder monitoring. Our subsample results using the percentage holdings of dedicated institutional investors and number of blockholders are reported in Columns (1) to (4) and Columns (5) to (8), respectively. We find that consistent with our prediction, the positive relation between the value of cash holdings and ETF ownership is more pronounced in firms with stronger shareholder

[37] In unreported results, our findings are consistent when we measure financial constraints using the payout ratio from Denis and Sibilkov (2009).

TABLE 9 Subsample test results: Value of cash holdings and ETF ownership in financially constrained versus unconstrained firms.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	WW index (Whited & Wu, 2006)				SA index (Hadlock & Pierce, 2010)			
	Financially constrained		Financially unconstrained		Financially constrained		Financially unconstrained	
VARIABLES	Excess return		Excess return		Excess return		Excess return	
ETF_{ILS} *ΔC	4.619**		−0.668		6.266***		0.645	
	(2.32)		(−0.40)		(2.99)		(0.40)	
ETF_{BFM}*ΔC		4.990**		−1.546		6.605**		−0.157
		(2.46)		(−0.93)		(3.11)		(−0.10)
ETF_{ILS}	1.076***		−0.075		1.029***		−0.008	
	(3.74)		(−0.32)		(3.30)		(−0.04)	
ETF_{BFM}		0.408**		−0.246		0.655**		−0.095
		(2.27)		(−1.06)		(3.07)		(−0.46)
ΔC	0.818***	0.818***	0.895***	0.916***	0.879***	0.878***	0.695***	0.717***
	(14.51)	(14.64)	(11.26)	(11.60)	(16.15)	(16.20)	(8.81)	(9.17)
Coefficient difference:								
ETF_{ILS} *ΔC	5.287** ($\chi^2 = 4.21$)				5.621** ($\chi^2 = 4.61$)			
ETF_{BFM}*ΔC	6.536** ($\chi^2 = 4.20$)				6.762** ($\chi^2 = 4.62$)			
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	18,718	18,718	18,381	18,381	18,708	18,708	18,720	18,720
Adjusted R-squared	0.138	0.138	0.156	0.156	0.152	0.152	0.134	0.134
Clustered S.E.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Industry F.E.	Y	Y	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y	Y	Y

Note: This table presents the estimated coefficients from subsample regressions for financially constrained versus unconstrained firms, and the results explain the association between the value of cash holdings and ETF ownership along with other control variables. Our sample covers the 2000–2021 period. The dependent variable is excess returns, calculated as stock *i*'s returns from year *t*−1 to year *t* minus stock *i*'s benchmark portfolio returns from year *t*−1 to year *t*. The benchmark portfolios are 25 Fama–French value-weighted portfolios. The variable of interest is the interaction term between ETF ownership and the change in the cash ratio. We partition our sample into financially constrained and unconstrained firms using the WW index in Columns (1) to (4) and the SA index in Columns (5) to (8), respectively. We classify a firm as financially constrained (unconstrained) if its financial constraint measure is above (below) the median in year *t*. Following Whited and Wu (2006), the WW index is calculated as WW = −0.091CF-0.062D+0.021*TLTD-0.044*LNTA+0.102*ISG-0.035*SG. Following Hadlock and Pierce (2010), the SA index is calculated as SA = (0.737*Size) +(0.043*Size^2)−(0.040*Age). Other control variables include the change in cash ratio, change in earnings ratio, change in net assets ratio, change in R&D ratio, change in interest ratio, change in dividend ratio, lagged cash ratio, net financing ratio, interaction between the lagged cash ratio and the change in cash ratio, interaction between leverage and change in cash ratio, and active (index) fund ownership. All change variables are calculated as the difference in fundamentals from year *t*−1 to year *t* according to data from Compustat. All ratio variables are scaled by the lagged market equity (price in year *t*−1 multiplied by shares outstanding in year *t*−1). We also perform chi-square tests to evaluate the significance of differences in the coefficients on ETF ownership between subsamples. All variable definitions are provided in the Appendix. All regressions are estimated with firm-clustered standard errors. Robust *t* statistics are presented in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

TABLE 10 Subsample test results: Value of cash holdings and ETF ownership in firms with strong versus weak shareholder monitoring.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Percentage holdings of dedicated institutional investors				Number of blockholders			
	Strong shareholder monitoring		Weak shareholder monitoring		Strong shareholder monitoring		Weak shareholder monitoring	
VARIABLES	Excess return		Excess return		Excess return		Excess return	
ETF_{ILS} *ΔC	6.750***		0.393		7.059***		0.515	
	(3.03)		(0.24)		(2.75)		(0.37)	
ETF_{BFM}*ΔC		5.904***		0.330		6.504**		0.245
		(2.62)		(0.21)		(2.53)		(0.18)
ETF_{ILS}	0.907***		0.056		1.381***		1.209***	
	(3.99)		(0.31)		(4.82)		(6.11)	
ETF_{BFM}		0.746**		0.207		1.084***		0.887***
		(2.02)		(1.09)		(2.80)		(4.14)
ΔC	0.806***	0.813***	0.882***	0.884***	0.816***	0.824***	0.822***	0.828***
	(15.95)	(16.10)	(11.91)	(12.17)	(13.99)	(14.22)	(13.69)	(13.99)
Coefficient difference:								
ETF_{ILS} *ΔC	6.357**				6.544**			
	($\chi^2 = 5.43$)				($\chi^2 = 5.02$)			
ETF_{BFM}*ΔC	5.574**				6.259**			
	($\chi^2 = 4.11$)				($\chi^2 = 4.55$)			
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	18,874	18,874	19,063	19,063	18,103	18,103	18,834	18,832
Adjusted R-squared	0.139	0.139	0.145	0.145	0.155	0.154	0.132	0.132
Clustered S.E.	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Industry F.E.	Y	Y	Y	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y	Y	Y	Y

Note: This table presents the estimated coefficients from subsample regressions for firms with strong versus weak shareholder monitoring, and the results explain the association between the value of cash holdings and ETF ownership along with other control variables. Our sample covers the 2000–2021 period. The dependent variable is excess returns, calculated as stock *i*'s returns from year *t*−1 to year *t* minus stock *i*'s benchmark portfolio returns from year *t*−1 to year *t*. The benchmark portfolios are 25 Fama–French value-weighted portfolios. The variable of interest is the interaction term between ETF ownership and the change in the cash ratio. We partition our sample into firms with strong and weak shareholder monitoring using the percentage holdings of dedicated institutional investors and number of blockholders, and the results are presented in Columns (1) to (4) and Columns (5) to (8), respectively. We classify a firm as a firm with strong (weak) shareholder monitoring if its shareholder monitoring measure is above (below) the median in year *t*. Using the transient/quasi-indexer/dedicated classification from Brian Bushee's Institutional Investor Classification Data, we define an institutional investor as a dedicated investor if it has been classified as "DED" in the database, and we calculate a firm's percentage holdings of dedicated institutional investors. We classify an institutional investor as a firm's blockholder if its stock holding in the firm is greater than 5%, and then we sum the number of blockholders in a firm–year. Other control variables include the change in cash ratio, change in earnings ratio, change in net assets ratio, change in R&D ratio, change in interest ratio, change in dividend ratio, lagged cash ratio, net financing ratio, interaction between the lagged cash ratio and the change in cash ratio, interaction between leverage and change in cash ratio, and active (index) fund ownership. All change variables are calculated as the difference in fundamentals from year *t*−1 to year *t* according to data from Compustat. All ratio variables are scaled by the lagged market equity (price in year *t*−1 multiplied by shares outstanding in year *t*−1). We also perform chi-square tests to evaluate the significance of differences in the coefficients on ETF ownership between subsamples. All variable definitions are provided in the Appendix. All regressions are estimated with firm-clustered standard errors. Robust *t* statistics are presented in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

monitoring. For example, using the percentage holdings of dedicated institutional investors in Columns (1) and (2), the coefficients on the interaction between ETF ownership and the change in cash holdings are 6.75 and 5.90, which are positively significant at the 1% level.[38] In contrast, in Columns (3) and (4), the coefficients on the interaction between ETF ownership and the change in cash holdings are 0.39 and 0.33, respectively, which are statistically insignificant. Columns (5) to (8) show that our results remain similar if we replace the shareholder monitoring proxy of dedicated institutional investors with the number of blockholders. For example, in Columns (5) and (6), the coefficients on the interaction between ETF ownership and the change in cash holdings are positively significant for firms with strong shareholder monitoring at the 1% and 5% levels, respectively. However, in Columns (7) and (8), the coefficients on the interaction for firms with weak shareholder monitoring are insignificant. Therefore, the findings confirm our precautionary cash hypothesis that shareholders in firms over which they have stronger monitoring power place higher value on additional cash holdings held by management in response to the anticipated risks induced by higher ETF ownership because managers in such firms tend to utilize resources more efficiently.

6 | CONCLUSION

In recent decades, ETFs have become increasingly popular in terms of both total market value and trading volume. Recent studies have found that ETF ownership increases stock return comovement and volatility and decreases the stock price informativeness of securities in ETF baskets (Ben-David et al., 2018; Da & Shive, 2018; Israeli et al., 2017; Pagano et al., 2019). Our paper is the first to examine the impact of ETFs on corporate liquidity decisions. In particular, we hypothesize that firms with higher ETF ownership increase precautionary cash holdings because ETF ownership is associated with greater market risks and financial friction.

We follow Opler et al. (1999) approach and find a positive relation between ETF ownership and the level of cash holdings. Furthermore, we show that broad ETF ownership contributes approximately two times more than sector ETF ownership to the increase in cash holdings. We further address the endogeneity concern by exploring the quasi-natural experiment of the annual reconstitution of the Russell index and use the exogenous changes in Russell index membership as an instrument for ETF ownership. We also examine the value of cash holdings and show that shareholders place a higher value on additional cash held by firms with higher ETF ownership, especially in financially constrained firms and/or firms with stronger shareholder monitoring. This result suggests that firms with higher ETF ownership hold more precautionary cash to avoid having to pass up positive-NPV projects.

We also show that an increase in ETF ownership is associated with an increase in a firm's market risks. By investigating how firms build their cash reserves, we find that firms tend to save cash by retaining internal cash flow. This evidence supports our argument that when facing increased stock return comovement in the equity market induced by ETF trading, firms with higher ETF ownership tend to hoard cash today to increase their future funding capacity out of precautionary motives. More importantly, we show evidence that stock return comovement and volatility risk (proxied by beta) serve as a partial mediator in the relationship between ETF and cash holdings.

In addition, following Huang and Mazouz (2018), we use excess cash to proxy abnormal cash reserve levels and find that ETF ownership also boosts excess cash holdings. Our results provide further support for the precautionary motive for holding cash (Simutin, 2010). We further analyze the mechanism by which ETF ownership increases cash holdings by employing Faulkender and Wang's (2006) approach. We examine the value of cash holdings and show that shareholders place higher value on additional cash held by firms with higher ETF ownership, especially in financially constrained firms and/or firms with stronger shareholder monitoring. This result further suggests that firms with higher ETF ownership hold more precautionary cash to avoid having to pass up positive-NPV projects.

Overall, while it is undeniable that investors benefit from trading ETFs due to their liquidity benefits and lower trading costs, ETFs may also introduce additional risks to the underlying stocks. Consistent with recent studies on the

[38] In unreported results, our findings are consistent when we measure shareholder monitoring using the percentage holdings of blockholders.

asset pricing implications of ETFs (i.e. comovement), we document important evidence from the corporate side that managers increase precautionary cash holdings in response to the higher market risks and financial frictions generated by ETFs. We believe that the impact of ETFs on both the financial market and corporate decisions can be further explored in future research.

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DATA AVAILABILITY STATEMENT

Availability of data	Data availability statement
Thomson-Reuters Mutual Fund Holdings (s12)	The data that support the findings of this study are available from Wharton Research Data Services. Restrictions apply to the availability of these data, which were used under license for this study. Data are available at https://wrds-www.wharton.upenn.edu/pages/get-data/thomson-reuters/mutual-fund-holdings-s12/ with the permission of Wharton Research Data Services.
Compustat—Capital IQ	The data that support the findings of this study are available from Wharton Research Data Services. Restrictions apply to the availability of these data, which were used under license for this study. Data are available at https://wrds-www.wharton.upenn.edu/pages/get-data/compustat-capital-iq-standard-poors/compustat/north-america-daily/ with the permission of Wharton Research Data Services.
CRSP	The data that support the findings of this study are available from Wharton Research Data Services. Restrictions apply to the availability of these data, which were used under license for this study. Data are available at https://wrds-www.wharton.upenn.edu/pages/get-data/center-research-security-prices-crsp/ with the permission of Wharton Research Data Services.
Brian Bushee's Institutional Investor Classification Data	The data that support the findings of this study are available at https://accounting-faculty.wharton.upenn.edu/bushee/iivars/#tqd.
Professor Kenneth French's website	The data that support the findings of this study are available at https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A: VARIABLE DEFINITIONS

Variables	Description (and *Compustat acronyms*)	Sources
ETF_{ILS}	Following Israeli et al. (2017), we calculate ETF ownership first as the percentage of firm *i*'s common shares outstanding held by ETFs at the end of each quarter. In the yearly value of cash holding regression, we then take the average ETF ownership from four quarters to calculate the yearly ETF ownership. See Section 2.1 and Equation (1) for more details.	Thomson Reuters and CRSP
ETF_{BFM}	Following Ben-David et al. (2018), we calculate ETF ownership as the sum of the ownership of all ETFs holding the stock at the end of each quarter. Using each individual ETF portfolio weight, we infer the quarterly ETF ownership for each stock of the ETF portfolio by multiplying the weight by the quarter-end ETF assets under management (AUM) and quarterly stock capitalization. ETF ownership in each stock is then aggregated across all ETFs that hold the stock in their portfolios. In the yearly value of cash holding regression, we then average the ETF ownership from four quarters to calculate the yearly ETF ownership. See Section 2.1 and Equation (2) for more details.	Thomson Reuters and CRSP
Broad and Sector ETF ownership	Following Bhojraj et al. (2020), we classify ETFs as broad and sector by analyzing their names. Specifically, we manually search the ETF names using Yahoo Finance and ETFdb.com to identify whether the ETFs focus on specific sectors or follow broad market indexes.	Yahoo Finance and ETFdb.com
Acquisitions	The ratio of acquisitions to net assets (total assets net of cash and cash equivalent) [*aqcy/(atq-cheq)*].	Compustat
Beta	The quarterly beta is estimated with weekly returns in the current quarter.	CRSP and Fama–French website

(Continues)

Variables	Description (and *Compustat acronyms*)	Sources
Capital expenditures	The ratio of capital expenditures to net assets (total assets net of cash and cash equivalent) [*capxy/(atq-cheq)*].	Compustat
Cashflow	The ratio of cash flow (operating income before depreciation less interest and taxes) to net assets (total assets net of cash and cash equivalent) [*(oibdpq-xintq-txtq)/(atq-cheq)*].	Compustat
Cash level	Ln(1+Cash/Net Assets). The natural logarithm of one plus the ratio of cash and cash equivalent to net assets (total assets net of cash and cash equivalent) [*ln(1+cheq/(atq-cheq))*]. In the robustness tests documented in Table 2 Panels B to D, Cash level also stands for cash-to-total asset ratio ($Ln(Cash/Asset)$), cash-to-revenue ratio ($Ln(Cash/Revenue)$) and merely cash holdings ($Ln(Cash)$), respectively.	Compustat
Common dividend	A dummy variable that assumes the value of one for dividend-paying firms and zero otherwise [*dvy, dvpq*].	Compustat
Change in cash ratio	Change in cash and cash equivalents from $t-1$ to t divided by the market value of equity at $t-1$. Mathematical expression: $\Delta C_{i,t}/M_{i,t-1}$.	Compustat
Change in earnings ratio	Change in earnings from $t-1$ to t divided by market value of equity at $t-1$. Mathematical expression: $\Delta E_{i,t}/M_{i,t-1}$, where E = ib+I+txdi+itci	Compustat
Change in net asset ratio	Change in net assets (total assets net of cash and cash equivalents) from $t-1$ to t divided by market value of equity at $t-1$. Mathematical expression:$\Delta NA_{i,t}/M_{i,t-1}$	Compustat
Change in R&D ratio	Change in R&D expenses from $t-1$ to t divided by market value of equity at $t-1$. Mathematical expression: $\Delta RD_{i,t}/M_{i,t-1}$.	Compustat
Change in interest ratio	Change in interest from $t-1$ to t divided by market value of equity at $t-1$. Mathematical expression: $\Delta I_{i,t}/M_{i,t-1}$.	Compustat
Change in dividend ratio	Change in dividend from $t-1$ to t divided by market value of equity at $t-1$. Mathematical expression: $\Delta D_{i,t}/M_{i,t-1}$.	Compustat
Debt	The ratio of long-term debt issuances to total assets [*dltisy/atq*].	Compustat
Index (or active) mutual fund ownership	The percentage of firm *i*'s common shares outstanding held by all index (or active) mutual funds at the end of each quarter. We identify index funds in the CRSP Mutual Fund database with fund names containing "index," "idx," "ind," "indx," "S&P," "russell," "nasdaq," "dow jones," "nyse," "SandP," "dj," "stoxx," "ftse," "wilshire," "morningstar," "msci," "kbw" and "bloomberg." We exclude ETFs from index funds.	Thomson Reuters, CRSP Mutual Fund and MFlinks
Industry sigma	Volatility of an industry's cash flow in the previous 20-quarter period. Industries are defined by 2-digit SIC codes. (Harford et al., 2008; Opler et al., 1999)	Compustat
Issue	The ratio of the sum of the sales of common and preferred stocks to total assets [*sstky/atq*].	Compustat
Lagged cash position (Ct−1)	Cash position ratio at $t-1$. Mathematical expression: $C_{i,t}/M_{i,t-1}$.	Compustat
Leverage (L)	Leverage at $t-1$. Mathematical expression: $L_{i,t}/M_{i,t-1}$, where L = (dltt+dlc)/(dltt+dlc+M)	Compustat

(Continues)

Variables	Description (and *Compustat acronyms*)	Sources
Size	Natural logarithm of net assets (total assets net of cash and cash equivalent) [*ln(atq-cheq)*].	Compustat
Market leverage	The ratio of long- and short-term debt to the sum of long- and short-term debt and the market value of equity [*(dlcq+dlttq)/(dlcq+dlttq+abs(prccq)*cshoq)*].	Compustat
Market-to-book ratio	The ratio of market value to net assets (total assets net of cash and cash equivalent). Market value is calculated as the market closing price times shares outstanding plus total liabilities [*(abs(prccq)*cshoq+ltq)/(atq-cheq)*].	Compustat
Net working capital	The ratio of net working capital to net assets (total assets net of cash and cash equivalent). Net working capital is calculated as current assets minus current liabilities [*(actq-lctq)/(atq-cheq)*].	Compustat
New financing ratio	Net new equity issues plus net new debt issues at t divided by market value of equity at $t-1$. Mathematical expression: $NF_{i,t}/M_{i,t-1}$, where NF = (sstk-prstkc)+(dltis-dltr)	Compustat
Number of blockholders	An institutional investor is classified as a firm's blockholder if its stock holding in the firm is greater than 5%. We then sum the number of blockholders in a firm–year. We classify a firm as under strong (weak) shareholder monitoring if its number of blockholders is above (below) the median in the year.	Thomson Reuters
Other	The ratio of the sum of the sales of property, investments and other sources of funds to total assets [*(sppey+sivy+fsrcoy)/atq*].	Compustat
Percentage holdings of dedicated institutional investors	We use the transient/quasi-indexer/dedicated classification from Brian Bushee's Institutional Investor Classification Data and calculated a firm's holdings by institutional investors classified as "DED." We classify a firm as under strong (weak) shareholder monitoring if its percentage holdings of dedicated institutional investors is above (below) the median in the year.	Thomson Reuters
R&D expenditures	The ratio of research and development (R&D) expenses to net assets (total assets net of cash and cash equivalent). We set R&D expenses equal to zero if R&D data are missing [*xrdq/(atq-cheq)*].	Compustat
$RB_{i,t}$	$RB_{i,t}$ is stock i's value-weighted benchmark return over year $t-1$ to t. The benchmark portfolio is one of the 25 Fama and French portfolios formed based on firm size and book-to-market.	CRSP, Fama–French ME and BE/ME Breakpoints
$R_{i,t}$	$R_{i,t}$ is firm i's stock return over year $t-1$ to t.	CRSP
SA index	Following Hadlock and Pierce (2010), the SA index is calculated as SA = (0.737*Size)+(0.043*Sizeˆ2)−(0.040*Age), where Size is the natural log of total assets [ln(*at*)] and Age is the number of years that a firm is listed with a non-missing stock price on Compustat. We classify a firm as financially constrained (unconstrained) if its SA index is above (below) the median in the year.	Compustat

(Continues)

Variables	Description (and *Compustat acronyms*)	Sources
Value-weighted excess return	Excess return is defined as $R_{i,t}-RB_{i,t}$.	Fama–French website
WW index	Following Whited and Wu (2006), the WW index is calculated as WW = −0.091CF-0.062D+0.021*TLTD-0.044*LNTA+0.102*ISG-0.035*SG, where CF is calculated as the sum of income before extraordinary items and depreciation and amortization divided by total assets at the beginning of the year [(*ib*+*dp*)/begin_*at*], D is an indicator that takes the value of one if the firm pays cash dividends [*dv*, *dvp*], TLTD is the ratio of the long-term debt to total assets at the end of the year [*dltt*/end_*at*], LNTA is the natural log of total assets [ln(end_*at*)], ISG is the firm's three-digit industry sales growth [*sale*] and SG is firm sales growth [*sale*]. We classify a firm as financially constrained (unconstrained) if its WW index is above (below) the median in the year.	Compustat

Note: This table summarizes the definitions and measurements of the dependent, independent and control variables used in our main regressions. We also provide the sources of data for each variable.