Do Exchange Traded Funds Affect Corporate Cash Holdings?

Beiqi Lin, Kelvin Tan, Lei Zhang *

August 2019

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 additional cash held by firms with higher ETF ownership. These findings are more pronounced among financially constrained firms and firms with stronger shareholder monitoring. Overall, our results suggest that firms hold more precautionary cash to mitigate future funding needs due to higher ETF-induced risks.

Keywords: Exchange traded funds, Cash holdings, ETF ownership, Financial constraints

JEL Classification: G23, G32

* All authors are affiliated with the UQ Business School at the University of Queensland, St Lucia, 4072 Queensland Australia. Their email addresses are as follows: Beiqi Lin (b.lin@business.uq.edu.au); Kelvin Tan (k.tan@business.uq.edu.au); Lei Zhang (l.zhang@business.uq.edu.au). The authors would like to thank Hasibul Chowdhury, Yaoqin Li, Robert Faff, Russ Wermers and seminar participants for their helpful comments. All error and omissions are our own.

1. Introduction

The demand for exchange-traded funds (ETFs) has grown markedly in recent decades (Investment Company Institute (ICI), 2014), as evidenced by Ernst and Young's report (EY, 2017) showing that total global ETF assets were only $417 billion in 2005, grew rapidly to $4.4 trillion by the end of September 2017 and are anticipated to reach $7.6 trillion by the end of 2020. More critically, ETF trading accounts for approximately 35% of the total trading volume in U.S. equity markets (Ben-David, Franzoni, and Moussawi, 2018).

Given the growing popularity of ETFs, researchers have attempted to investigate the asset pricing/market efficiency implications of ETF ownership. The empirical evidence is mixed. For example, prior studies document that an increase in ETF ownership is accompanied by an increase in stock return comovement (Da and Shive, 2017), an increase in stock return volatility (Ben-David, Franzoni and Moussawi, 2018) and a decline in stock price informativeness (Israeli, Lee, and Sridharan, 2017), while Saglam, Tuzun, and Wermers (2019) find that ETF ownership increases the stock liquidity of the underlying stocks in the ETF's basket. Li, Liu and Sun (2018) examine the effects of ETFs on the real efficiency of the underlying stocks and find that ETF ownership increases the sensitivity of a firm's investment to its stock price.

Interestingly, the corporate finance implications of the rising importance of ETFs have not yet been fully explored. One important consideration is how ETF ownership affects corporate liquidity management and in particular corporate cash holdings. The reason for focusing on cash holdings is that managers can easily have access to and discretionarily alter cash reserves (Dittmar and Mahrt-Smith, 2007). The purpose of this paper is twofold. First, we examine whether firms hold more or less cash in

response to a higher ETF ownership. Second, we examine whether and to what extent the market reacts to such additional cash holdings.

Based upon the extant findings on the asset pricing implications of ETFs, we propose two competing hypotheses on the effects of ETF ownership on corporate cash holdings. On the one hand, Da and Shive (2017) show that ETFs significantly increases the return comovement of the underlying stocks in the ETF's basket due to ETF arbitrage activities. For example, arbitrageurs frequently take simultaneous opposite positions in the ETF and the underlying stocks. In this case, stocks held by ETFs comove more with each other than warranted by common exposure to fundamentals. The excessive comovement induced by ETFs increases the market risk of the underlying stocks. Moreover, Ben-David, Franzoni and Moussawi (2018) show that ETFs significantly increases the non-fundamental volatility of the securities in their baskets because ETF funds attract more short-horizon liquidity traders and therefore more liquidity shocks will propagate to the underlying securities through ETF trading.

These findings suggest that ETFs increase the stock price risks of the underlying stocks with either higher market risk or higher idiosyncratic risk. As a result, we expect that firms will increase the amount of cash holdings in response to higher anticipated risks generated by ETFs. We term this hypothesis as *the precautionary cash hypothesis*. The precautionary cash hypothesis suggests that a firm with higher ETF ownership should hold more cash for precautionary purposes to mitigate future financing needs and to avoid the underinvestment problem.

On the other hand, prior studies have documented that ETF trading leads to higher stock liquidity (Saglam, Tuzun and Wermers, 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 investor base for the underlying stocks. Therefore, 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, thereby cash holdings may decrease with higher ETF ownership. We term this hypothesis as *the liquidity substitution hypothesis*.

We test the two competing hypotheses using a comprehensive sample of US stocks from 2000 to 2016. We first identify ETF funds from multiple data sources including CRSP, Compustat and Option Metrics. We then compute firm-level ETF ownership from the Thomson-Reuters Mutual Fund Holdings database. We construct two measures of ETF ownership used in the literature: the first – the fraction of a stock's capitalization that is held by ETFs – is proposed by Ben-David, Franzoni and Moussawi (2018), while the other – the aggregate number of shares held by all ETFs divided by the total number of shares outstanding – is from Israeli, Lee and Sridharan (2017). Next, we match these data with the accounting and financial information collected from Compustat and CRSP, which results in a sample of 52,603 firm-year observations.

We proceed as follows. First, we confirm the findings in the prior studies suggesting that ETF funds increase stock risks of the underlying firms. In particular, we examine the relation between ETF ownership and stock beta and stock volatility. We find that ETF ownership is highly positively related to both the market beta of the stock and stock return volatility. A one standard deviation increase in ETF ownership is related to 5.1% (2.2%) increase in the market beta (stock return volatility) relative to its unconditional mean, respectively. These results are consistent with the previous studies (i.e., Da and Shive, 2017; Ben-David, Franzoni and Moussawi, 2018) and show that ETF ownership increases both market risk and nonfundamental risk of the stock.

Next, we formally test the cash holding implication of ETF ownership. Following Opler, Pinkowitz, Stulz, and Williamson (1999), our baseline regression shows a positive relation between ETF ownership and cash holdings, which supports the *precautionary cash hypothesis* and rejects *the liquidity substitution hypothesis*. A one standard deviation increase in ETF ownership leads to 3.7% increase in corporate cash holdings relative to the unconditional mean. Our results are robust after controlling for firm fixed effects and year fixed effects.

To mitigate concerns of endogeneity, we follow Ben-David, Franzoni and Moussawi (2018) and employ a quasi-natural experiment based on the annual reconstitution of the Russell indexes.[1] 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 shows that an increase in ETF ownership leads firms to hold more cash, when we use bandwidths ranging from 100 to 250 stocks around the cut-off (1000^{th} market capitalization).

Although we attribute the positive relation between ETF ownership and levels of cash holdings to the precautionary cash explanation, there might be an alternative explanation to describe this positive relation. Given that ETFs attract short-horizon noise traders who trade on liquidity or index-mimicking (Ben-David Franzoni and Moussawi, 2018; Israeli, Lee and Sridharan, 2017), they are unlikely to monitor managerial performance (e.g., Chen, Harford, and Li, 2007; Callen and Fang, 2013; Dasgupta and Piacentino, 2015; Schmidt and Fahlenbrach, 2017; Levit, 2018). With weaker shareholder monitoring, managers may hoard more cash in order to pursue

[1] The quasi-natural experiment based on the annual reconstitution of the Russell indexes has also been used in the following recent studies such as Chang, Hong, and Liskovich (2014), Appel, Gormley, and Keim (2016), and Schmidt and Fahlenbrach (2017).

personal interests (Jensen and Meckling, 1976). Thus, this alternative explanation may also explain why firms with higher ETF ownership hold more cash. We call this the *free cash flow problem hypothesis*.

To disentangle the main effect (precautionary cash vs. free cash flow problem) that drives the positive relation between ETF ownership and the level of cash holdings, we turn our test to the value of cash holdings – specifically, to find the relation between ETF ownership and the value of cash. The *precautionary cash hypothesis* predicts a positive relation between ETF ownership and the value of cash holdings because the greater market beta and volatility induced by higher ETF ownership increase firm risks, which encourages firms to hold precautionary cash to mitigate future funding needs in order to avoid the underinvestment problem. Thus, the additional cash holding will be more valuable because it allows firms to pursue value-adding investments when they might otherwise be bypassed. On the contrary, the *free cash flow hypothesis* predicts a negative relation between ETF ownership and the value of cash holdings. That is because higher ETF ownership provides less shareholder monitoring, which in turn could allow managers with larger cash reserves to pursue more value-destroying activities (Jensen, 1986; Masulis, Wang, and Xie, 2007; Schmidt and Fahlenbrach, 2017).

Following Faulkender and Wang (2006), we examine how ETF ownership affects the marginal value of cash holdings. In particular, we regress excess stock returns on the interaction term between the change in cash holdings and ETF ownership. We find a positive and significant relationship between ETF ownership and the value of cash holdings. Specifically, a one standard deviation increase in ETF ownership is associated with an increase in the value of an additional dollar of cash by 9.19 cents to 13.18 cents (or 8.3% to 17.4%) from an average firm, which is economically significant. Therefore,

our results support the *precautionary cash hypothesis* and reject the *free cash flow hypothesis*. This suggests that holding an additional dollar of precautionary cash is considered value-increasing by the market in response to the risks induced by ETFs.

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 as well as the size and age (SA) financial constraint index (Hadlock and Pierce, 2010). For shareholder monitoring, we split the sample by the degree of dedicated investor ownership (Bushee, 1998; Balakrishnan, Blouin, and Guay, 2018) and the number of block holders (Edmans and Manso, 2010; Kang, Luo and Na, 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 rather than the liquidity substitution hypothesis and the free cash flow 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 affects its corporate liquidity management.

Second, we contribute to the literature on the determinants of corporate cash holdings.[2] Most importantly, we provide an alternative explanation of the phenomenon of increasing corporate cash in recent decades (Bates, Kahle, and Stulz, 2009). We

[2] See, for example, Opler et al. (1999), Foley et al. (2007), Harford, Mansi, and Maxwell (2008), Chen, et al. (2012) and Bates, Chang, and Chi (2018).

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 higher cash holdings are value increasing.[3] Our analysis establishes that increasing "precautionary" cash holdings to avoid the underinvestment problem is a value-increasing response to the increased risk induced by high 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 presents the mechanism tests, and Section 5 concludes.

2. Data and Summary Statistics

2.1 Data and Variables

We first identify all ETFs traded on the U.S. exchanges from CRSP, Compustat, and OptionMetrics. In particular, ETFs are identified as securities on CRSP with a share code of 73 and on Compustat or OptionMetrics with an issue type of "%". We then obtain the reported equity holdings for each identified ETF using the Thomson-Reuters S12 database on mutual fund holdings and obtain each ETF's market value and each security's market value from CRSP. Our final sample consists of 591 distinct equity ETFs in the United States between January 2000 and December 2016.[4]

[3] See, for example, Faulkender and Wang (2006), Dittmar and Mahrt-Smith, (2007), Denis and Sibilkov, (2009), Liu and Mauer (2011), Tong (2011), Louis, Sun, and Urcan (2012), Harford, Klasa, and Maxwell (2014); Bates, Chang and Chi (2018), and Aktas, Louca and Petmezas (2019).

[4] These statistics are similar to those of Israeli, Lee and Sridharan (2017), who identify 443 unique ETFs in the U.S. between 2000 and 2014. Our ETF ownership measures are slightly lower than that of Ben-David, Franzoni and Mossawi (2018) (e.g., 2.6%), because we use a broader sample of firms in our analysis.

To construct the ETF ownership, we employ two methods from the literature. In the first measure, we follow Israeli, Lee and Sridharan (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):

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

In the second measure, we follow Ben-David, Franzoni and Moussawi (2018, hereafter called 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):

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

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*; and $AUM_{j,t}$ is the asset 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. Because accounting and financial information in Compustat is more complete at the yearly level than at the quarterly level,[5] we calculate average ETF ownership on a stock-year basis and merge the average ETF ownership sample with Compustat. To be consistent with other studies on cash holdings, we exclude financial firms and utility firms (Standard Industrialization Codes: 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 52,603 firm-year observations and 7,461 unique firms.

[5] Our results are qualitatively similar when we use a quarter-level sample. These results are available upon request.

We define a firm's *cash level* as the natural logarithm of one plus the ratio of cash to net assets.[6] We then consider an array of firm-level controls used in prior studies on corporate cash holdings (Opler et al., 1999; Harford, Mansi and Maxwell, 2008). Size is defined as the natural logarithm of net assets, where net assets are calculated as total assets less cash and marketable securities. Cash flow is measured as operating income before depreciation less interests 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 refers to the research and development expenses (any missing value is replaced with zero). Capx refers to the capital expenditures. Market leverage is calculated as total debt divided by the sum of the total debt and market value of equity. Industry sigma is a measure of the volatility of an industry's cash flow in the previous 10-year period. Industries are defined by 2-digit SIC codes. Common dividend is a dummy variable, which 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 holdings the stock. All ratio variables are winsorized at the 1st and 99th percentiles. All variable definitions are detailed in Appendix A.

2.2 Summary Statistics

Table 1 reports a summary of descriptive statistics of variables used in our main analysis. Our sample includes 52,603 firm-years from U.S. publicly traded firms over the period from 2000 to 2016. Panel A summarizes variables used in the analysis for cash level and ETF ownership and Panel B shows variables used in the analysis for the

[6] We use Ln(1+cash ratio) rather than Ln(cash ratio) to avoid losing firms with zero cash.

value of cash and ETF ownership. In Panel A, the cash level is 0.329 on average, which is equivalent to approximately 39% (exp(0.329) - 1) cash and cash equivalent relative to net assets (excluding cash and cash equivalent). [7]

[Insert Table 1 about here]

Our variables of interest, ETF ownership measured by ETF_{ILS} and ETF_{BFM}, have a mean of 1.5% (ranging from 0 to 8.9%) and a mean of 1.5% (ranging from 0 to 10.8%), respectively. Our ETF ownership measures are lower than those of ILS and BFM because a broader sample of all U.S. firms (including small firms) are used in our analysis. For example, BFM (2018) only consider stocks in the S&P 500 or Russell 3000 index and find that ETF ownership for S&P 500 firms is 2.6% and ETF ownership for Russell 3000 firms is 2.8%. Generally, stocks that are included in the index have higher ETF ownership than those that are not included in the index. We obtain a similar figure with BFM (2018) if we restrict our sample to the Russell 3000 index (i.e., 2.5%). Overall, our ETF ownership measures are consistent with the literature. The ETF_{ILS} and ETF_{BFM} measures of ETF ownership are highly correlated in our sample, with a correlation of 0.9.

We also report the other characteristics of our sample firms. The market-to-book ratio is relatively high, with an average of 5.81 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 2.16 and a median of 1.53. On average, our firms have an average market capitalization of $4.826 billion and invest 23.4% of net assets in R&D but only 7.3% of net assets in capital

[7] Our cash level measure is scaled by net assets. We also calculate the cash ratio scaled by total assets. The mean of our cash/total assets is equal to 21.46%, consistent with literature. 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%.

expenditure. Our typical firms borrow approximately 21% of the total firm value in debt. A total of 39.6% of the firms in the sample are dividend-paying firms.

Table 1 Panel B provides descriptive statistics for the variables in our value of cash analysis. The excess return has an average of -3% and a median of -8.9%, which is consistent with Faulkender and Wang (2006).[8] Our variable of interest is the interaction between ETF ownership and the change in cash ratio. We find that the change in cash ratio has a mean of 0.008 compared to a mean of 0.004 in Faulkender and Wang (2006), which is consistent with the recent trend of increasing cash holdings (Bates, Kahle, and Stulz, 2009). The descriptive statistics of all other variables are also generally consistent with Faulkender and Wang (2006). For example, our sample firms have a change in earnings ratio of 1.7% in contrast to 1.1% in Faulkender and Wang's (2006) study.

3. ETF Ownership and Cash Holdings

3.1 ETF ownership and firm risks

Since our precautionary cash hypothesis suggests that corporate managers hold more precautionary cash when they face higher risks induced by ETF ownership, in this section, we investigate the relation between ETF ownership and firm risks. Similar to BFM (2018), who find a positive relation between ETF ownership and volatility, we regress firm risks (volatility) on ETF_{BFM}. We also regress market beta of the stock on ETF_{BFM} along with common control variables used in the cash holding analysis.

[8] 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 and 2001.

Table 2 shows the regression results of ETF ownership and firm risks. In Columns (1) and (2), the dependent variable is market beta, which is estimated using rolling CAPM beta from monthly returns in the last 36 months. The coefficient (2.936) on ETF_{BFM} is significantly positive at the 1% significance level in Column (1), suggesting that an increase in ETF ownership is associated with higher systematic risk. Our result is consistent after controlling for active and index fund ownership in Column (2). These results are economically significant. For example, in Column (2), a one standard deviation increase in ETF ownership is related to 5.12% (=3.023*2.22%/1.31) increase in the market beta relative to the unconditional mean of 1.31.

In Columns (3) and (4), the dependent variable is stock volatility, which is estimated as the standard deviation of monthly returns in the year. The coefficient (0.101) on ETF_{BFM} is significantly positive at the 1% significance level in Column (3), suggesting that an increase in ETF ownership is associated with higher volatility. Our result is consistent after controlling for active and index fund ownership in Column (4). These results are economically significant. For example, in Column (4), a one standard deviation increase in ETF ownership is related to 2.16% (=0.147*2.20%/0.15) increase in stock volatility relative to the unconditional mean. Overall, our results show that ETF ownership increases firm risks.

[Insert Table 2 about here]

3.2 ETF Ownership and cash holdings

To examine the association between ETF ownership and the level of corporate cash holdings, we follow the approach that is developed by Opler et al. (1999). Specifically, we run an OLS regression of the cash measure on either of the two measures of ETF ownership (ETF_{ILS} and ETF_{BFM}) and other commonly used cash determinants suggested

by the literature. We also control for year fixed effects and firm fixed effects in our analysis, and our results are reported with firm clustered standard errors. The regression is as follows.

$$Cash\ level_{i,t} = \beta_1 ETF\ ownership_{i,t} + \beta_2 Ln(NA_{i,t}) + \beta_3 \frac{FCF_{i,t}}{NA_{i,t}} + \beta_4 \frac{NWC_{i,t}}{NA_{i,t}} + \beta_5 \frac{MV_{i,t}}{NA_{i,t}}$$
$$+ \beta_6 \frac{RD_{i,t}}{NA_{i,t}} + \beta_7 \frac{CAPX_{i,t}}{NA_{i,t}} + \beta_8 (Industry\ Sigma_{i,t}) + \beta_9 L_{i,t} + \beta_{10} Dividends_{i,t}$$
$$+ Active\ fund\ ownership_{i,t} + Index\ fund\ ownership_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (3)$$

The dependent variable is firm *i*'s cash level in year *t*, measured as the natural logarithm of one plus the ratio of cash to net assets. 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 ($Ln(NA_{i,t})$), cash flow ($\frac{FCF_{i,t}}{NA_{i,t}}$), net working capital ($\frac{NWC_{i,t}}{NA_{i,t}}$), payout to shareholders ($Dividends_{i,t}$), market-to-book ratio ($\frac{MV_{i,t}}{NA_{i,t}}$), research and development expenses ($\frac{RD_{i,t}}{NA_{i,t}}$), capital expenditure ($\frac{CAPX_{i,t}}{NA_{i,t}}$), market leverage ($L_{i,t}$), and industry sigma. 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.

Table 3 reports the regression of the level of cash holdings on ETF ownership shown in Equation (3). The variables of interest, ETF ownership (ETF_{ILS} and ETF_{BFM}), are reported in Columns (1) and (2), and 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 on average when they experience higher ETF ownership. Economically, the results indicate that a one-standard-deviation change in ETF ownership is positively

related to an increase of 1.2% (using ETF_{ILS}) or 1.2% (using ETF_{BFM}) in Ln(1+cash ratio).[9] Given the mean of cash ratio is 0.329, the increase of 1.2% in cash level would translate into a 3.7% increase from the mean of cash level, which is economically significant.

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 (2) are not affected by the addition of these two investor ownership variables. Opler et al. (1999) identify that cash flow is the most significant determinant of cash holdings. From our analysis, a one-standard-deviation change in the cash flow ratio is positively related to an increase of 4.5% in the level of cash holdings. With ETF ownership having a similar economic significance to that of the cash flow ratio, we can view ETF ownership as an economically significant determinant of cash holdings. In summary, our results support the precautionary cash hypothesis, which states that firms hold more precautionary cash in response to higher risks induced by increasing ETF ownership.

[Insert Table 3 about here]

3.3 Identification using Russell index reconstitution

To establish a causality interpretation of the positive relation between ETF ownership and cash holdings, we follow the identification strategy from Ben-David, Franzoni and Moussawi (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

[9] The calculations of economic significance using both ETF_{ILS} and ETF_{BFM} measures are as follows: 1.21% = [exp(0.575*0.021)-1]; 1.17% = [exp(0.532*0.022)-1].

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, Franzoni and Moussawi, 2018). For example, the 1000th stock is given a relatively smaller portfolio weight for being included in Russell 1000, while the 1001th stock is given a much larger weight for being included in 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 capitalization close to the cut-off (1000th) are relatively random events after controlling 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 it 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 it 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 a positive one (or negative one), it means that there will be likely to be an exogenous increase (decrease) in ETF ownership.

Our sample also considers several bandwidths by including 100, 150, 200, and 250 stocks on each side of the cut-off separately. 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 the 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 an ETF ownership with $Switched_{i,t}$, controlling for industry fixed effects (h_j) 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 on the fitted value of ETF ownership from the first stage, controlling for 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 4 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, Franzoni and Moussawi, 2018), we find that the estimated coefficient of the instrument $Switched_{i,t}$ is positively significant in all columns, which confirms the relevance criteria of 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 (100, 150, 200, and 250) 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 3.637 to 13.792. Similar

to Ben-David, Franzoni and Moussawi (2018), we notice that the magnitude of the IV estimates is much larger than the OLS effects in Table 3 because the estimated IV coefficients reflect a local average treatment effect (Angrist and Imbens, 1995). In particular, 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, the drastic changes in index status and ETF ownership result in a greater impact on the level of cash holdings than on the average firm. Overall, our results are consistent with the findings that higher ETF ownership leads firms to hold more cash.

[Insert Table 4 about here]

4. Mechanism Test: the Value of Cash Holdings

4.1 Alternative explanation

Thus far, we have shown a robust positive relation between cash holdings and ETF ownership. We interpret this positive relation to be consistent with our *precautionary cash hypothesis*, in which ETF ownership increases both market risk and volatility on the underlying stocks. However, there is an alternative argument, namely, the *free cash flow problem hypothesis* (Jensen and Meckling, 1976), which predicts a positive relation between cash holdings and ETF ownership. In particular, given that ETFs attract noise traders, who trade on liquidity or index-mimicking features (Ben-David, Franzoni and Moussawi, 2018; Israeli, Lee, and Sridharan, 2017), they are unlikely to monitor managerial performance (Chen, Harford and Li, 2007; Callen and Fang, 2013; Dasgupta and Piacentino, 2015; Schmidt and Fahlenbrach, 2017; Levit, 2018).

Therefore, firms with higher ETF ownership might be associated with weaker shareholder monitoring, and the managers in such firms are likely to hoard more cash in order to pursue personal interests. Importantly, the implication of these two hypotheses (precautionary cash hypothesis vs. free cash flow problem hypothesis) is different for the value of cash holdings.

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 along with higher ETF ownership because precautionary cash is held to meet future funding needs, thereby benefitting shareholders. On the other hand, the *free cash flow problem hypothesis* predicts that the value of cash is decreasing along with higher ETF ownership because the additional cash held allows detrimental management practices and thereby decreases shareholders' wealth.

4.2 The value of cash holdings

To determine a more precise value of cash holdings for firms with higher ETF ownership, we follow Faulkender and Wang (2006) and run an OLS regression on excess market returns against ETF ownership, the interaction between change in cash holdings and ETF ownership, and various firm characteristics scaled by the past year's market capitalization. Our regression also controls for year fixed effects and industry fixed effects and uses firm-clustered standard errors. The regression is specified as follows in Equation (6).

$$r_{i,t} - R^{B}_{i,t} = \alpha + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2 ETF\ ownership_{i,t} + \beta_3 ETF\ ownership_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} +$$

$$\beta_4 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \beta_5 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \beta_6 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \beta_7 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \beta_8 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \beta_9 \frac{C_{i,t}}{M_{i,t-1}} + \beta_{10} L_{i,t} + \beta_{11} \frac{NF_{i,t}}{M_{i,t-1}}$$

$$+\beta_{12} Active\ fund\ ownership_{i,t} + \beta_{13} Index\ fund\ ownership_{i,t}$$

$$+\beta_{14} Active\ fund\ ownership_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_{15} Index\ fund\ ownership_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}}$$

$$+\beta_{15} \frac{C_{i,t}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_{16}\ L_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_i + \delta_t + \varepsilon_{i,t} \qquad (6)$$

The dependent variable is the value-weighted excess return, which is 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* ($R^{B}_{i,t}$)[10]. The variable of interest is the interaction between ETF ownership (ETF_{ILS} and ETF_{BFM}) and change in cash holdings, and β_3 represents the effect of ETF ownership on the value of additional dollar of cash. The definitions of all other variables are provided in Appendix A.

Table 5 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). Using the coefficient estimates from Column (1), an additional dollar of cash is valued by shareholders at \$0.888. Our baseline result is consistent with Faulkender and Wang (2006), who find that an additional dollar of cash increases shareholder wealth by \$0.751.

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

Since our objective is to differentiate between the two hypotheses (precautionary cash hypothesis vs. free cash flow problem hypothesis), we investigate whether the value of an additional dollar of cash increases with ETF ownership in Columns (2) to (5), which augment the specification in Column (1) by including ETF ownership. We also consider the interaction effect of lagged cash position and leverage from Faulkender and Wang (2006) in Columns (3) and (5). Statistically, the estimated coefficients corresponding to the interaction of the ETF ownership with the change in cash is positively significant at the 5% level in Columns (2) to (4) and significant at the 1% level in Column (5). These results indicate that the marginal value of cash increases with an increase in the amount of ETF ownership using 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 75.83 cents.[11] A one standard deviation increase in ETF ownership increases the value of an additional cash by 13.18 cents (from 75.83 to 89.01 cents) or 17.4% from an average firm.[12] Similarly, in Column (5), the value of an additional dollar of cash to shareholders in the mean firm is $1.09.[13] A one standard deviation increase in ETF ownership increases the value of an additional cash by 9.19 cents (from 1.09 to 1.18 dollar) or 8.4% from an average firm.[14]

Overall, our results show that the marginal value of cash is increasing in the amount of ETF ownership. These findings support the *precautionary cash hypothesis* that firms hold precautionary cash when higher ETF ownership induces additional firm

[11] The value of 75.83 cents is calculated from (1.364 + 6.275 × 0.018 + 0 × 0.152 - 7.025 × 0.053 - 0.526 × 0.182 - 1.272 × 0.197)/100.
[12] Since one deviation of ETF_{ILS} is *2.1%* shown in Table 1 Panel B, the value of 89.01 cents is calculated from (1.364 + 6.275 × (0.018+*0.021*) + 0 × 0.152 - 7.025 × 0.053 - 0.526 × 0.182 - 1.272 × 0.197).
[13] The value of $1.09 is calculated from (1.354 + 4.375 × 0.018 + 0 × 0.152 – 0 × 0.053 - 0.523 × 0.182 - 1.267 × 0.197).
[14] Since one deviation of ETF_{BFM} is *2.1%* shown in Table 1 Panel B, the value of 1.18 dollar is calculated from (1.354 + 4.375 × (0.018+*0.021*) + 0 × 0.152 – 0 × 0.053 - 0.523 × 0.182 - 1.267 × 0.197).

risks and that shareholders place a 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 sample periods but rather driven by the ETF ownership.

[Insert Table 5 about here]

4.3 Subsample analyses

To add more credence to our argument that a firm holds more precautionary cash to mitigate the anticipated risks associated with increasing ETF ownership, we further perform subsample tests in which our precautionary cash hypothesis 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.

4.3.1 Financially constrained versus non-financially constrained firms

Denis and Sibilkov (2009) show that cash holdings are more valuable for financially constrained firms with higher hedging needs 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 non-financially constrained firms using the following two measures: (1) the WW index (Whited and

Wu, 2006) and (2) the SA index (Hadlock and Pierce, 2010).[15] If a firm's financial constraint measure is above (or below) its median by year, we classify it as financially constrained (or unconstrained) in the year *t*. 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.

Table 6 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. Consistent with our prediction, we find that the positive relation between value of cash holdings and ETF ownership is more pronounced in financially constrained firms. For example, using the WW index, in Columns (1) and (2), the coefficients on the interaction between ETF ownership and change in cash holdings are 6.591 and 7.651, respectively, which are positively significant at 10% and 5% levels, respectively. In contrast, in Columns (3) and (4), the coefficients on the interaction between ETF ownership and change in cash holdings are 1.447 and -3.357, respectively, which are not statistically significant. Using the SA index, our results in Columns (5) to (8) show a similar finding as those obtained with the WW index.

Specifically, the coefficient on the interaction between ETF ownership (measured by ETF_{BFM}) and change in cash holdings is positive and statistically significant in financially constrained firms (Column 6) while it is not statistically significant in financially unconstrained firms (Column 8). Therefore, the findings confirm our precautionary cash hypothesis that financially constrained firms with higher hedging

[15] Variable definitions are provided in Appendix A.

needs will react more to the anticipated risks and uncertainties induced by ETF ownership and will tend to hold more cash than financially unconstrained firms.[16]

[Insert Table 6 about here]

4.3.2 Strong shareholder monitoring versus weak shareholder monitoring

Dittmar and Mahrt-Smith (2007) find that the value of cash holdings is higher in firms with good internal governance that can help shareholders defend against the inefficient use of internal resources by managers. Thus, to further rule out the free cash flow problem hypothesis, we partition our sample into strong shareholder monitoring and weak shareholder monitoring based on two measures: (1) the percentage holdings of dedicated institutional investors (e.g., Bushee, 1998; An and Zhang, 2013; Callen and Fang 2013; Boone and White, 2015; Balakrishnan, Blouin and Guay, 2018) and (2) the number of blockholders (e.g., Noe, 2002; Ashbaugh-Skaife, Collins and LaFond, 2006; Larcker, Richardson and Tuna, 2007; Attig, Guedhami and Mishra, 2008; Edmans and Manso, 2010; Edmans, 2014; Kang, Luo and Na, 2018).[17] We classify a firm as a firm with strong (weak) shareholder monitoring if these two measures is above (below) their sample median in the year. We repeat the regression in Equation (6) in the subsamples and predict that the positive association between the value of cash holdings and ETF ownership is stronger in firms with stronger shareholder monitoring.

Table 7 presents the estimated coefficients from regressions explaining the association between the value of cash holdings and ETF ownership across firms with

[16] In unreported results, our findings are consistent when we measure financial constraint using payout ratio from Denis and Sibilkov (2009).
[17] Variable definitions are provided in Appendix A.

both strong and weak shareholder monitoring. Our subsample results using percentage holdings of dedicated institutional investors and number of blockholders are reported in Columns (1) to (4) and Columns (5) to (8), respectively. Consistent with our prediction, we find that the positive relation between the value of cash holdings and ETF ownership is more pronounced in firms with stronger shareholder 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 change in cash holdings are 11.335 and 8.102, respectively, which are positively significant at the 1% and 5% levels, respectively.[18] In contrast, in Columns (3) and (4), the coefficients on the interaction between ETF ownership and change in cash holdings are 0.897 and 0.034, which are statistically insignificant. Columns (5) to (8) show that our results remain similar if we replace the proxy of dedicated institutional investors with the number of blockholders for shareholder monitoring. For example, in Columns (5) and (6), the coefficients on the interaction between ETF ownership and change in cash holdings are positively significant in firms with strong shareholder monitoring at the 1% and 5% levels, respectively. However, in Column (7) and Column (8), the coefficients on the interaction for firms with weak shareholder monitoring is marginally significant and insignificant, respectively. Therefore, the findings confirm our precautionary cash hypothesis that shareholders in firms which they have stronger monitoring power place higher value on additional cash holdings held by management in response to the anticipated risks and uncertainties induced by higher ETF ownership because managers in such firms tend to utilize resources more efficiently.

[Insert Table 7 about here]

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

5. Conclusion

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

We follow Opler et al.'s (1999) approach and find a positive relation between ETF ownership and the level of cash holdings. We further address the endogeneity concern by exploring a 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.

In addition, we analyze the mechanism by which ETF ownership increases cash holdings by employing Faulkender and Wang's (2006) approach. In particular, we 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 experience greater future uncertainties and hold more precautionary cash to avoid passing up positive NPV projects.

Overall, while it is undeniable that investors benefit from ETF trading due to its liquidity and lower trading costs, ETFs may also introduce additional risks to the

financial market. Consistent with recent studies on the asset pricing implications of ETFs, we document an important evidence from the corporate side, that managers increase precautionary cash holdings in response to higher anticipated risks 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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Appendix A. Variable Definitions

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.

Variables	Description (and *Compustat acronyms*)	Sources
ETF_{ILS}	Following Israeli, Lee, and Sridharan (2017), ETF ownership is first calculated as the percentage of firm *i*'s common shares outstanding held by ETFs at the end of each quarter. 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, CRSP
ETF_{BFM}	Following Ben-David, Franzoni and Moussawi (2018), ETF ownership is calculated as the sum of the ownership of all ETFs holding the stock at the end of each quarter. Using each individual ETF portfolio weight, quarterly ETF ownership in each stock of the ETF portfolio is inferred by multiplying the weight by the quarter-end ETF AUM and quarterly stock capitalization. ETF ownership in each stock is then aggregated across all ETFs that hold the stock in their portfolios. We then average the ETF ownerships from four quarters to calculate the yearly ETF ownership. See Section 2.1 and Equation (2) for more details.	Thomson-Reuters, CRSP
Beta	The monthly beta is estimated using rolling beta from monthly returns in the last 36 months. To obtain the yearly beta, we average the monthly beta.	CRSP, Fama-French website
Capx/NA	The ratio of capital expenditure expenses to net assets (total assets net of cash and cash equivalent). [*capx/(at-che)*]	Compustat
Cash flow/NA	The ratio of cash flow to net assets (total assets net of cash and cash equivalent). Cash flow is defined as the operating income less interest and taxes. [*(ibdp-xint-txt)/(at-che)*]	Compustat
Cash level	Natural logarithm of one plus the cash-to-net-assets ratio (total assets net of cash and cash equivalent). [*che/(at-che)*]	Compustat
Dividend	Dummy variable that takes the value of one for dividend-paying firms and zero otherwise.	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. Index funds are identified using the CRSP Mutual Fund database by identifying fund names containing "index", "idx ", "ind ", "indx ", "S&P", "russell", "nasdaq", "dow jones", "nyse", "SandP", "dj", "stoxx", "ftse", "wilshire", "morningstar", "msci", ""kbw", and "bloomberg".	Thomson-Reuters, CRSP Mutual Fund, MFlinks

Industry sigma	Industry sigma is a measure of the volatility of an industry's cash flow for a 10-year period, which is calculated as the industry average of the standard deviation of cash flow/assets for the prior 10 years. Industries are defined by 2-digit SIC codes.	Compustat
Log(Net assets)	Natural logarithm of net assets (total assets net of cash and cash equivalent). [*ln(at-che)*]	Compustat
Market leverage	The ratio of long-term debt and short-term debt to the sum of long-term debt and short-term debt and the market value of equity. [*(dlc+dltt)/(dlc+dltt+abs(prcc_c)*csho)*]	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(prcc_c)*csho+lt)/(at-che)*]	Compustat
Net assets (NA)	Total assets minus cash and cash equivalent. [*at-che*]	Compustat
Net working capital/NA	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. [*(act-lct)/(at-che)*]	Compustat
New financing	Net new equity issues plus net new debt issues. [*(sstk-prstkc)+(dltis-dltr)/(at-che)*]	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 the median (below the median) in the year.	Thomson-Reuters
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 the median (below the median) in the year.	Thomson-Reuters
R&D/NA	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 missing R&D data. [*xrd/(at-che)*]	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*Size^2) -(0.040*Age), where Size is the natural log of total assets [ln(at)] and Age is the number of years 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 the median (below the median) in the year.	Compustat
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 the median (below the median) in the year.	Compustat

Table 1. Descriptive statistics

This table provides descriptive statistics for the variables in our sample of 52,603 firm-years from U.S. publicly traded firms from 2000 to 2016. The table presents the means, standard deviations, and different percentiles (25^{th}, 50^{th}, and 75^{th}). Panel A report descriptive statistics for all variables used in cash level and ETF ownership analysis and Panel B reports descriptive statistics for all the variables used in the value of cash and ETF ownership analysis. 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 (price in year *t*-1 multiplied by shares outstanding in year *t*-1). All variables are winsorized at the 1^{st} and 99^{th} percentiles. All variable definitions are provided in Appendix A.

Panel A. Descriptive statistics for cash level and ETF ownership

N=52,603

Variable	Mean	SD	P25	Median	P75
Cash level	0.329	0.518	0.039	0.130	0.372
ETF_{ILS}	0.015	0.021	0.000	0.005	0.024
ETF_{BFM}	0.015	0.022	0.000	0.006	0.023
Size	5.811	2.310	4.186	5.852	7.426
Cash flow/NA	-0.295	2.092	0.010	0.085	0.142
Net working capital	0.712	1.883	0.076	0.262	0.581
Market-to-book ratio	5.443	18.426	1.262	1.861	3.388
R&D/NA	0.234	0.866	0.000	0.004	0.099
Capx/NA	0.073	0.085	0.023	0.044	0.087
Market leverage	0.210	0.234	0.011	0.133	0.326
Industry sigma	2.605	1.534	1.453	2.480	3.514
Common dividend	0.396	0.489	0.000	0.000	1.000
Active fund ownership	0.138	0.142	0.028	0.119	0.218
Index fund ownership	0.043	0.061	0.005	0.027	0.067

Panel B. Descriptive statistics for the value of cash and ETF ownership

N=31,884

Variable	Mean	SD	P25	Median	P75
Stock return ($r_{i,t}$)	0.167	0.984	-0.225	0.061	0.365
Benchmark return ($R^B_{i,t}$)	0.173	0.330	-0.022	0.127	0.316
Excess return ($r_{i,t} - R^B_{i,t}$)	-0.030	0.536	-0.341	-0.089	0.173
ETF_{ILS}	0.018	0.021	0.001	0.010	0.029
ETF_{BFM}	0.018	0.021	0.001	0.011	0.027
Change in cash ratio (ΔC)	0.008	0.139	-0.028	0.002	0.038
Change in earnings ratio (ΔE)	0.017	0.207	-0.028	0.005	0.035
Change in net asset ratio (ΔNA)	0.035	0.404	-0.038	0.022	0.107
Change in R&D ratio (ΔRD)	0.000	0.018	0.000	0.000	0.002
Change in interest ratio (ΔI)	0.001	0.017	-0.002	0.000	0.002
Change in dividend ratio (ΔD)	0.000	0.009	0.000	0.000	0.000
Lagged cash ratio (C_{t-1})	0.182	0.243	0.040	0.102	0.225
Leverage (L)	0.197	0.216	0.010	0.130	0.305
Net financing ratio	0.019	0.181	-0.038	0.000	0.033
Active fund ownership	0.152	0.111	0.049	0.147	0.234
Index fund ownership	0.053	0.044	0.016	0.043	0.081

Table 2. ETF ownership and firm risks (beta and volatility)

This table presents the estimated coefficients from regressions explaining the association between beta, volatility, and ETF ownership, along with other control variables. Our sample covers the 2000-2016 period. In Columns (1) to (2) and Columns (3) to (4), the dependent variables are beta and volatility, respectively. Beta (annual) takes the average of monthly beta, which is estimated using rolling beta from monthly returns in the last 36 months. Volatility is the standard deviation of the monthly stock price from the CRSP in year t. For the main explanatory variable, we follow Ben-David, Franzoni and Moussawi (2018) and construct ETF_{BFM} as the sum of the ownership of all ETFs holding stock *i* at the end of each quarter, which is averaged at the yearly level. Size is defined as the natural logarithm of net assets. Cash flow is measured as operating income before depreciation less interests and taxes. Net working capital is calculated as the 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 refers to the research and development expenses (any missing value is replaced with zero). Capx refers to the capital expenditures. Market leverage is calculated as the total debt divided by the sum of the total debt and market value of equity. Industry sigma is a measure of the volatility of an industry's cash flow in the previous 10-year 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. We further control for active fund ownership and index fund ownership. Active (index) fund ownership refers to the sum of the ownership by all active (index) mutual funds holdings the stock. All ratio variables are winsorized at the 1st and 99th percentiles. All variable definitions are provided in Appendix A. All regressions are estimated with firm and year fixed effects and firm-clustered standard errors. Robust t-statistics statistics are presented in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable=	Beta (mean=1.31)		Volatility (mean=0.15)	
VARIABLES	(1)	(2)	(3)	(4)
ETF_{BFM}	2.936***	3.023***	0.101***	0.147***
	(6.67)	(6.89)	(2.66)	(3.72)
Size	-0.020	-0.019	-0.017***	-0.016***
	(-1.25)	(-1.21)	(-12.12)	(-11.60)
Cash Flow	0.002	0.002	-0.000	-0.000
	(0.22)	(0.21)	(-0.14)	(-0.18)
Net Working Capital	0.018**	0.018**	-0.002	-0.002
	(2.21)	(2.22)	(-1.49)	(-1.42)
Market-to-book Ratio	-0.001	-0.001	0.000***	0.000***
	(-0.92)	(-0.92)	(4.94)	(4.96)
R&D Expenditures	-0.035	-0.035	-0.011***	-0.011***
	(-1.34)	(-1.34)	(-3.27)	(-3.27)
Capital Expenditures	0.201*	0.201*	-0.038***	-0.037***
	(1.80)	(1.80)	(-2.98)	(-2.93)
Market Leverage	0.194***	0.193***	0.081***	0.080***
	(4.17)	(4.15)	(16.34)	(16.05)
Industry Sigma	-0.112***	-0.112***	-0.007***	-0.007***
	(-6.74)	(-6.74)	(-5.48)	(-5.53)
Common Dividend	-0.110***	-0.109***	-0.001	-0.001
	(-5.14)	(-5.13)	(-0.61)	(-0.66)
Active Fund Ownership		-0.006		-0.021***
		(-0.14)		(-2.90)
Index Fund Ownership		-0.341		-0.091*
		(-1.06)		(-1.96)
Observations	45,503	45,503	47,917	47,917
Adjusted R-squared	0.058	0.058	0.156	0.157
Cluster	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y
Std. Dev. ETF_{BFM}	2.23%	2.23%	2.20%	2.20%

Table 3. ETF ownership and the level of cash holdings

This table presents estimated coefficients from regressions explaining the association between cash holdings and ETF ownership, along with other control variables. Our sample covers the 2000-2016 period. The dependent variable is the cash level, which is 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 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, averaged at the yearly level. ETF_{BFM} is calculated as the sum of ownership of all ETFs holding stock *i* at the end of each quarter, averaged at the yearly level. Columns (1) and (2) and Columns (3) and (4) report the results 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. Size is defined as the natural logarithm of net assets. Cash flow is measured as operating income before depreciation less interests 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 refers to the research and development expenses (any missing value is replaced with zero). Capx refers to the capital expenditures. Market leverage is calculated as total debt divided by the sum of the total debt and market value of equity. Industry sigma is a measure of the volatility of an industry's cash flow in the previous 10-year period. Industries are defined by 2-digit SIC codes. Common dividend is a dummy variable, which 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 holdings the stock. All ratio variables are winsorized at the 1st and 99th percentiles. All variable definitions are provided in Appendix A. All regressions are estimated with firm and year fixed effects and firm-clustered standard errors. Robust t-statistics statistics are presented in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable: Cash Level	(1)	(2)	(3)	(4)
ETF_{ILS}	0.575***	0.524***		
	(6.94)	(6.12)		
ETF_{BFM}			0.532***	0.476***
			(7.84)	(6.96)
Ln(Net assets)	-0.103***	-0.104***	-0.103***	-0.104***
	(-28.87)	(-28.87)	(-29.02)	(-29.00)
Cash flow ratio	0.007**	0.007**	0.007**	0.007**
	(2.23)	(2.25)	(2.24)	(2.26)
Net working capital	0.151***	0.151***	0.151***	0.151***
	(28.92)	(28.92)	(28.94)	(28.94)
Market-to-book ratio	0	0	0	0
	(0.49)	(0.47)	(0.50)	(0.48)
R&D expenditures	0.036***	0.036***	0.036***	0.036***
	(4.48)	(4.49)	(4.47)	(4.48)
Capital expenditures	0.199***	0.197***	0.199***	0.198***
	(9.69)	(9.63)	(9.71)	(9.65)
Market leverage	-0.008	-0.006	-0.008	-0.006
	(-1.17)	(-0.81)	(-1.19)	(-0.82)
Industry sigma	0.003	0.003	0.003	0.003
	(1.29)	(1.30)	(1.23)	(1.24)
Common dividend	0.010***	0.010***	0.010***	0.010***
	(3.15)	(3.25)	(3.12)	(3.22)
Active fund ownership		0.041***		0.041***
		(3.51)		(3.44)
Index fund ownership		-0.001		0.011
		(-0.06)		(0.67)
Observations	52,603	52,603	52,603	52,603
Adjusted R-squared	0.705	0.705	0.705	0.705
Cluster	Firm	Firm	Firm	Firm
Firm F.E.	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y

Table 4. Russell index reconstitution: ETF ownership and the level of cash holdings

This table reports estimates from 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 2016. Panel A shows the first-stage results, where the dependent variables are the two measures of ETF ownership (ETF_{ILS} and ETF_{BFM}). The explanatory variable is our instrument variable, $Switch_{i,t}$. $Switch_{i,t}$ is a categorical variable taking 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, $Switch_{i,t}$ 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, $Switch_{i,t}$ equals zero. Columns (1) to (4) and (5) to (8) present bandwidths ranging from 100 to 250 stocks around the cut-off (1000^{th} market capitalization). Control variables used in all panels are the same as those presented in Table 3. All ratio variables are winsorized at the 1^{st} and 99^{th} percentiles. All variable definitions are provided in Appendix A. Panel B presents the second-stage results where the dependent variable is the cash level, which is 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 $Switch_{i,t}$. The regression considers year fixed effects and industry fixed effects. Industries are defined by Fama-French 38 industry portfolios. The regression is reported with firm-clustered standard errors. Robust t-statistics are presented in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: First-Stage Regression

Dependent variable=	ETF_{ILS}				ETF_{BFM}			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	band100	band150	band200	band250	band100	band150	band200	band250
Switched	0.003***	0.002***	0.002***	0.001***	0.003***	0.003***	0.003***	0.003***
	(7.65)	(7.63)	(6.35)	(6.02)	(5.28)	(6.62)	(5.50)	(5.90)
Ln(Assets)	-0.001*	-0.001***	-0.001***	-0.002***	0.00	-0.001**	-0.001***	-0.002***
	(-1.78)	(-3.32)	(-4.78)	(-6.40)	(-0.59)	(-2.21)	(-3.63)	(-4.83)
Cash flow/Assets	0	0	0	0	0.001*	0.002**	0.00	0.00
	(0.23)	(0.40)	(-0.19)	(-0.77)	(1.77)	(2.13)	(1.31)	(0.94)
Net working capital/Assets	-0.000**	-0.000**	-0.001***	-0.001***	0	0	0	0
	(-2.05)	(-2.53)	(-2.74)	(-3.06)	(-0.16)	(-0.67)	(-1.10)	(-1.11)
Market-to-book ratio	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(3.05)	(3.14)	(3.83)	(3.98)	(3.48)	(3.57)	(4.00)	(3.96)
R&D expenditures/Assets	0	0	0	-0.001	0	0.001	0	0
	(-0.03)	(0.17)	(-0.49)	(-0.85)	(0.10)	(0.56)	(-0.15)	(-0.45)
Capital expenditures/Assets	0.004	0.003	0.002	0.001	0.01	0.006*	0.00	0.00
	(1.39)	(1.36)	(0.98)	(0.60)	(1.25)	(1.69)	(1.44)	(1.13)
Market leverage	-0.007***	-0.005***	-0.004***	-0.004***	-0.009***	-0.006***	-0.006***	-0.005***
	(-5.36)	(-4.18)	(-3.88)	(-3.43)	(-5.11)	(-4.25)	(-3.99)	(-3.43)
Industry sigma	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.91)	(-0.10)	(0.07)	(-0.12)	(0.03)	(-0.74)	(-0.71)	(0.06)
Common dividend dummy	0.001	0.001*	0.001	0	0.001	0.001*	0.001	0
	(1.42)	(1.93)	(1.57)	(0.97)	(1.11)	(1.74)	(1.13)	(0.43)

Active fund ownership	0.002	0.002	0.001	0.001	0.003	0.003	0.001	0
	(0.77)	(1.07)	(0.69)	(0.35)	(0.98)	(1.17)	(0.26)	(-0.02)
Index fund ownership	0.424***	0.435***	0.442***	0.448***	0.408***	0.421***	0.432***	0.440***
	(38.37)	(45.14)	(51.19)	(55.93)	(28.22)	(33.58)	(37.38)	(40.09)
Observations	2,019	2,959	3,896	4,865	2,019	2,959	3,896	4,865
Adjusted R-squared	0.881	0.892	0.895	0.897	0.717	0.744	0.753	0.747
Cluster	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								
Dependent variable=	Cash level							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	band100	band150	band200	band250	band100	band150	band200	band250
$\widehat{ETF_{ILS}}$	13.792***	9.652***	10.907**	7.787*				
	(3.06)	(2.64)	(2.51)	(1.86)				
$\widehat{ETF_{BFM}}$					10.405***	6.449**	6.413**	3.637*
					(2.79)	(2.51)	(2.41)	(1.83)
Ln(Assets)	-0.146***	-0.140***	-0.129***	-0.122***	-0.153***	-0.144***	-0.135***	-0.128***
	(-8.77)	(-8.55)	(-7.57)	(-7.47)	(-9.59)	(-9.22)	(-8.63)	(-8.76)
Cash flow/Assets	0.081*	0.094**	0.096**	0.101***	0.068	0.085*	0.089**	0.096***
	(1.81)	(2.10)	(2.22)	(3.14)	(1.47)	(1.88)	(2.04)	(2.98)
Net working capital/Assets	0.141***	0.158***	0.171***	0.181***	0.136***	0.155***	0.167***	0.178***
	(3.08)	(3.49)	(3.70)	(4.25)	(3.12)	(3.50)	(3.72)	(4.27)
Market-to-book ratio	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(-3.27)	(-3.92)	(-4.18)	(-5.16)	(-3.42)	(-3.96)	(-4.20)	(-5.15)
R&D expenditures/Assets	0.167**	0.193***	0.204***	0.207***	0.165**	0.190***	0.200***	0.204***
	(2.35)	(2.67)	(2.92)	(3.56)	(2.29)	(2.60)	(2.86)	(3.47)
Capital expenditures/Assets	0.043	0.042	0.029	0.068	0.034	0.032	0.023	0.065
	(0.45)	(0.54)	(0.39)	(1.08)	(0.34)	(0.41)	(0.32)	(1.05)
Market leverage	0.249***	0.232***	0.222***	0.187***	0.240***	0.223***	0.210***	0.175***
	(4.41)	(5.63)	(5.71)	(5.61)	(4.49)	(5.87)	(6.00)	(5.82)
Industry sigma	0.002	0.009	0.007	0.008	0.007	0.01	0.009	0.008
	(0.20)	(1.24)	(1.07)	(1.48)	(0.78)	(1.55)	(1.47)	(1.51)
Common dividend dummy	-0.050***	-0.052***	-0.050***	-0.045***	-0.048***	-0.050***	-0.047***	-0.043***
	(-3.71)	(-4.88)	(-5.03)	(-5.16)	(-3.66)	(-4.96)	(-5.16)	(-5.27)
Active fund ownership	0.014	-0.014	-0.033	-0.035	0.003	-0.015	-0.024	-0.031
	(0.24)	(-0.30)	(-0.71)	(-0.90)	(0.05)	(-0.34)	(-0.55)	(-0.82)
Index fund ownership	-6.197***	-4.524***	-5.090***	-3.740**	-4.589***	-3.044***	-3.045***	-1.852**
	(-3.22)	(-2.82)	(-2.63)	(-1.98)	(-2.99)	(-2.77)	(-2.62)	(-2.08)
Observations	2,019	2,959	3,896	4,865	2,019	2,959	3,896	4,865
Adjusted R-squared	0.702	0.761	0.739	0.77	0.685	0.764	0.755	0.787
Cluster	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

Table 5. Regression results: the value of cash holdings and ETF ownership

This table presents estimated coefficients from regressions explaining the association between the value of cash holdings and ETF ownership, along with other control variables. Our sample covers the 2000-2016 period. The dependent variable is excess returns, which are 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 twenty-five Fama-French value-weighted portfolios. The variable of interest is the interaction term between ETF ownership and the change in cash ratio. We have two measures of ETF ownership (ETF_{ILS} and ETF_{BFM}). 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 lagged market equity (price in year *t*-1 multiplied by shares outstanding in year *t*-1). All variable definitions are provided in Appendix A. 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.

Variables	(1)	(2)	(3)	(4)	(5)
ETF_{ILS}		0.379*	0.346*		
		(1.96)	(1.79)		
ETF_{ILS} *ΔC		6.315**	6.275**		
		(2.48)	(2.47)		
ETF_{BFM}				0.283	0.244
				(1.51)	(1.30)
ETF_{BFM}*ΔC				5.075**	4.375*
				(2.09)	(1.83)
ΔC	0.888***	0.904***	1.364***	0.897***	1.354***
	(23.60)	(15.61)	(16.83)	(15.56)	(16.76)
ΔE	0.490***	0.491***	0.486***	0.491***	0.486***
	(19.77)	(19.80)	(19.65)	(19.79)	(19.63)
ΔNA	0.205***	0.206***	0.211***	0.205***	0.211***
	(15.16)	(15.12)	(15.54)	(15.10)	(15.52)
ΔRD	0.690***	0.690***	0.634**	0.684***	0.628**
	(2.74)	(2.75)	(2.53)	(2.72)	(2.50)
ΔI	-2.007***	-2.003***	-1.901***	-1.998***	-1.896***
	(-6.71)	(-6.68)	(-6.41)	(-6.66)	(-6.40)
ΔD	1.600***	1.622***	1.606***	1.615***	1.598***
	(4.89)	(4.96)	(4.92)	(4.94)	(4.89)
Lagged cash position	0.230***	0.229***	0.201***	0.229***	0.201***
	(11.40)	(11.29)	(9.56)	(11.28)	(9.55)
Leverage	-0.398***	-0.396***	-0.390***	-0.396***	-0.390***
	(-24.24)	(-24.06)	(-23.95)	(-24.03)	(-23.94)
NF	-0.153***	-0.158***	-0.182***	-0.158***	-0.182***
	(-4.99)	(-5.12)	(-5.96)	(-5.12)	(-5.95)
Active fund ownership		0.054*	0.053*	0.058**	0.058**
		(1.80)	(1.79)	(1.97)	(1.96)
Index fund ownership		-0.067	0.016	-0.000	0.085
		(-0.23)	(0.05)	(-0.00)	(0.29)
Active fund ownership*ΔC		0.243	0.022	0.262	0.066
		(0.66)	(0.06)	(0.71)	(0.18)
Index fund ownership*ΔC		-9.322**	-7.025*	-7.425**	-4.657
		(-2.55)	(-1.91)	(-2.13)	(-1.34)
C_{t-1}*ΔC			-0.526***		-0.523***
			(-5.02)		(-4.99)
L*ΔC			-1.272***		-1.267***
			(-8.01)		(-7.96)
Observations	31,884	31,884	31,884	31,884	31,884
Adjusted R-squared	0.13	0.131	0.131	0.131	0.131
Cluster	Firm	Firm	Firm	Firm	Firm
Industry F.E.	Y	Y	Y	Y	Y
Year F.E.	Y	Y	Y	Y	Y

Table 6. Subsample of test results: value of cash holdings and ETF ownership in financially constrained vs. unconstrained firms

This table presents the estimated coefficients from subsample regressions of financially constrained vs. 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 2000-2016 period. The dependent variable is excess returns, which are 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 twenty-five Fama-French value-weighted portfolios. The variable of interest is the interaction term between ETF ownership and the change in cash ratio. We partition our sample into financially constrained and unconstrained firms using the WW index and SA index presented in Columns (1) to (4) and Columns (5) to (8), respectively. We classify a firm as financially constrained (unconstrained) if its financial constraint measure is above the median (below the median) in year *t*. Following Whited and Wu (2006), 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), 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). All variable definitions are provided in Appendix A. 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.

Dependent variable=	Excess return							
Classification	WW index (Whited and Wu, 2006)				SA index (Hadlock and Pierce, 2010)			
	Financially constrained		Financially unconstrained		Financially constrained		Financially unconstrained	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ETF_{ILS}	1.359***		-0.251		0.778**		0.148	
	(3.79)		(-0.94)		(2.13)		(0.65)	
ETF_{ILS} *ΔC	6.591*		1.447		6.115		2.933	
	(1.69)		(0.44)		(1.51)		(0.87)	
ETF_{BFM}		1.061***		-0.376		0.482		0.082
		(3.19)		(-1.44)		(1.36)		(0.37)
ETF_{BFM}*ΔC		7.651**		-3.357		6.502*		-0.855
		(2.08)		(-1.09)		(1.74)		(-0.26)
ΔC	1.377***	1.374***	1.401***	1.400***	1.406***	1.398***	1.085***	1.062***
	(12.48)	(12.52)	(8.56)	(8.59)	(13.32)	(13.30)	(6.25)	(6.13)
ΔE	0.467***	0.467***	0.534***	0.534***	0.535***	0.535***	0.431***	0.430***
	(13.76)	(13.76)	(12.84)	(12.82)	(15.51)	(15.50)	(10.81)	(10.79)
ΔNA	0.274***	0.274***	0.153***	0.153***	0.252***	0.252***	0.184***	0.183***

	(12.81)	(12.79)	(7.54)	(7.48)	(11.72)	(11.73)	(9.83)	(9.76)
ΔRD	0.283	0.279	0.694	0.701	0.495	0.492	0.924*	0.910*
	(0.86)	(0.84)	(1.35)	(1.36)	(1.64)	(1.62)	(1.90)	(1.86)
ΔI	-2.067***	-2.063***	-1.402***	-1.400***	-2.377***	-2.367***	-1.222**	-1.220**
	(-4.87)	(-4.86)	(-2.95)	(-2.95)	(-5.84)	(-5.81)	(-2.48)	(-2.47)
ΔD	2.083***	2.083***	1.231**	1.209**	2.354***	2.359***	1.387***	1.372***
	(4.72)	(4.71)	(2.36)	(2.31)	(4.90)	(4.91)	(3.00)	(2.97)
Lagged cash position	0.207***	0.206***	0.226***	0.226***	0.229***	0.229***	0.174***	0.174***
	(7.23)	(7.21)	(6.25)	(6.29)	(7.58)	(7.58)	(5.20)	(5.20)
Leverage	-0.361***	-0.361***	-0.488***	-0.491***	-0.418***	-0.417***	-0.400***	-0.401***
	(-14.38)	(-14.38)	(-19.94)	(-20.03)	(-16.65)	(-16.61)	(-16.71)	(-16.71)
NF	-0.202***	-0.202***	-0.151***	-0.150***	-0.115**	-0.116**	-0.263***	-0.262***
	(-4.34)	(-4.34)	(-3.31)	(-3.27)	(-2.46)	(-2.47)	(-6.20)	(-6.17)
Active fund ownership	-0.068	-0.052	-0.024	-0.022	0.020	0.031	-0.036	-0.033
	(-1.37)	(-1.06)	(-0.58)	(-0.52)	(0.43)	(0.65)	(-0.90)	(-0.84)
Index fund ownership	-1.619**	-1.253*	-1.129***	-1.101***	-0.710	-0.415	-1.286***	-1.274***
	(-2.38)	(-1.93)	(-2.98)	(-2.86)	(-1.09)	(-0.66)	(-3.77)	(-3.70)
Active fund ownership*ΔC	0.329	0.294	-0.227	-0.194	0.417	0.397	0.268	0.352
	(0.54)	(0.49)	(-0.41)	(-0.35)	(0.71)	(0.69)	(0.47)	(0.62)
Index fund ownership*ΔC	-9.547*	-9.514*	-1.309	3.497	-6.969	-6.287	-0.416	3.629
	(-1.79)	(-1.87)	(-0.26)	(0.69)	(-1.28)	(-1.22)	(-0.08)	(0.72)
C_{t-1}*ΔC	-0.653***	-0.648***	-0.532***	-0.531***	-0.619***	-0.612***	-0.442***	-0.433***
	(-4.49)	(-4.45)	(-2.93)	(-2.92)	(-4.27)	(-4.22)	(-2.66)	(-2.60)
L*ΔC	-1.168***	-1.168***	-1.336***	-1.347***	-1.202***	-1.196***	-0.964***	-0.962***
	(-4.80)	(-4.81)	(-5.39)	(-5.43)	(-5.16)	(-5.12)	(-3.80)	(-3.79)
Observations	14,657	14,657	14,664	14,664	14,858	14,858	14,864	14,864
Adjusted R-squared	0.142	0.142	0.171	0.171	0.164	0.164	0.139	0.139
Cluster	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

Table 7. Subsample of test results: value of cash holdings and ETF ownership in firms with strong versus weak shareholder monitoring

This table presents the estimated coefficients from subsample regressions of 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 2000-2016 period. The dependent variable is excess returns, which are 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 twenty-five Fama-French value-weighted portfolios. The variable of interest is the interaction term between ETF ownership and the change in cash ratio. We partition our sample into strong shareholder monitoring and weak shareholder monitoring firms using the percentage holdings of dedicated institutional investors and number of blockholders, and they 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 the median (below the median) in the 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). All variable definitions are provided in Appendix A. 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.

Dependent variable =	Excess return							
Classification	Percentage holdings of dedicated institutional investors				Number of blockholders			
	Strong shareholder monitoring		Weak shareholder monitoring		Strong shareholder monitoring		Weak shareholder monitoring	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ETF_{ILS}	-0.003		0.647**		0.365		0.461	
	(-0.01)		(1.96)		(1.43)		(1.42)	
ETF_{ILS} *ΔC	11.335***		0.897		7.875***		7.798*	
	(3.24)		(0.26)		(2.65)		(1.69)	
ETF_{BFM}		-0.196		0.589*		0.312		0.148
		(-0.75)		(1.87)		(1.30)		(0.48)
ETF_{BFM}*ΔC		8.102**		0.034		5.998**		4.585
		(2.32)		(0.01)		(2.18)		(1.00)
ΔC	1.346***	1.324***	1.369***	1.366***	1.104***	1.087***	1.416***	1.408***
	(9.26)	(9.06)	(14.10)	(14.16)	(7.70)	(7.61)	(14.08)	(14.02)
ΔE	0.468***	0.469***	0.489***	0.489***	0.434***	0.434***	0.512***	0.512***
	(12.70)	(12.67)	(15.43)	(15.43)	(13.07)	(13.05)	(15.03)	(15.00)

ΔNA	0.199***	0.198***	0.217***	0.217***	0.186***	0.186***	0.225***	0.225***
	(10.83)	(10.72)	(11.79)	(11.79)	(10.45)	(10.42)	(12.48)	(12.46)
ΔRD	0.962**	0.947**	0.476	0.476	1.456***	1.440***	0.319	0.317
	(2.52)	(2.47)	(1.46)	(1.46)	(3.85)	(3.80)	(0.98)	(0.98)
ΔI	-1.266***	-1.257***	-2.188***	-2.187***	-1.404***	-1.399***	-2.166***	-2.161***
	(-2.71)	(-2.68)	(-5.84)	(-5.84)	(-3.47)	(-3.45)	(-5.54)	(-5.53)
ΔD	1.137**	1.124**	1.898***	1.896***	1.438***	1.421***	1.597***	1.597***
	(2.26)	(2.23)	(4.52)	(4.52)	(3.09)	(3.05)	(3.61)	(3.61)
Lagged cash position	0.237***	0.239***	0.181***	0.181***	0.190***	0.190***	0.217***	0.216***
	(6.99)	(6.97)	(6.91)	(6.91)	(6.49)	(6.45)	(7.63)	(7.61)
Leverage	-0.427***	-0.427***	-0.367***	-0.367***	-0.384***	-0.383***	-0.380***	-0.381***
	(-17.54)	(-17.52)	(-16.58)	(-16.57)	(-17.30)	(-17.26)	(-16.26)	(-16.28)
NF	-0.225***	-0.226***	-0.162***	-0.162***	-0.217***	-0.217***	-0.170***	-0.168***
	(-5.05)	(-5.03)	(-4.00)	(-3.99)	(-5.65)	(-5.65)	(-3.91)	(-3.87)
Active fund ownership	0.042	0.050	0.076*	0.080*	0.041	0.042	0.329***	0.342***
	(0.96)	(1.15)	(1.69)	(1.80)	(0.95)	(0.98)	(6.16)	(6.47)
Index fund ownership	0.180	0.235	-0.727	-0.665	-0.130	-0.098	-0.610	-0.444
	(0.44)	(0.57)	(-1.46)	(-1.34)	(-0.30)	(-0.23)	(-1.44)	(-1.04)
Active fund ownership*ΔC	-0.205	-0.227	0.501	0.546	0.192	0.214	0.601	0.704
	(-0.37)	(-0.41)	(0.91)	(1.01)	(0.39)	(0.44)	(0.85)	(1.00)
Index fund ownership*ΔC	-8.386	-3.493	-7.014	-6.401	-12.201***	-9.088**	-3.607	-1.053
	(-1.64)	(-0.68)	(-1.43)	(-1.37)	(-2.61)	(-2.05)	(-0.66)	(-0.20)
C_{t-1}*ΔC	-0.458***	-0.439**	-0.584***	-0.584***	-0.208	-0.203	-0.634***	-0.634***
	(-2.66)	(-2.54)	(-4.47)	(-4.48)	(-1.37)	(-1.33)	(-4.61)	(-4.61)
L*ΔC	-1.246***	-1.236***	-1.240***	-1.239***	-0.753***	-0.748***	-1.539***	-1.533***
	(-5.26)	(-5.19)	(-6.17)	(-6.16)	(-3.44)	(-3.42)	(-7.14)	(-7.10)
Observations	14,554	14,554	17,330	17,330	14,999	14,999	16,885	16,885
Adjusted R-squared	0.149	0.149	0.154	0.154	0.140	0.140	0.164	0.164
Cluster	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