

Tracking the Passive Pulse: Unraveling ETFs' Role in Corporate Investment

Vignesh Ranga
Zifeng Ye
Bachelor Thesis
Stockholm School of Economics
2024



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Abstract

This study examines the relationship between ETF ownership and corporate investment sensitivity to stock price signals, focusing on firm size as a moderating factor. Using data from 2005-2015 and employing two instrumental variable (IV) approaches to address endogeneity, we analyze small-, mid-, and large-cap firms, while distinguishing between market and non-market ETFs. The findings suggest that while mid-cap firms exhibit a modest increase in investment sensitivity driven by ETF ownership, the effect diminishes for small-cap and large-cap firms, where interaction terms remain consistently insignificant. These results challenge prior assumptions about ETFs amplifying price informativeness, particularly when firm size is accounted for. By introducing size-based disaggregation, this study underscores the nuanced and potentially limited role of ETFs in shaping corporate investment.

Keywords:

Exchange-Traded Funds (ETFs), Corporate Investment, Tobin's Q, Firm Size

Authors:

Vignesh Ranga (25605)
Zifeng Ye (25603)

Tutor:

Ran Guo, Lecturer at Rotterdam School of Management

Examiner:

Ramin Baghai, Professor, Department of Finance

1 – Introduction

The influence of exchange-traded funds (ETFs) on real corporate investment decisions has become a focal point of research in financial economics, especially given the exponential growth of passive investment strategies in recent years (Ben-David, Franzoni, and Moussawi 2018). ETFs, which bundle securities into a single, tradable asset, have transformed investor behavior by improving market liquidity, reducing transaction costs, and enabling diversified market exposure (Ivanov, Ivan, and Lenkey 2018). As passive investing has surged, ETFs now account for a significant portion of trading volume in U.S. equity markets, prompting researchers to question how they affect stock price informativeness, volatility, and ultimately, corporate investment decisions (Israeli, Lee, and Sridharan 2017). While ETFs can facilitate efficient price discovery, their market impact is complex and multifaceted, as studies indicate they may also distort corporate investment signals by impacting the underlying dynamics of stock prices (Da and Shive 2018). This paper investigates how ETF ownership affects the sensitivity of firms' investments to Tobin's q —a proxy for a firm's investment opportunities. In doing so, our study builds upon and extends the findings of Antoniou et al. (2023), who suggest that the effects of ETF ownership on investment sensitivity vary based on firm size, with small and mid-cap firms being more sensitive due to their less efficient information environments. Our study diverges by examining whether this effect holds for large-cap firms, which Antoniou et al. excluded based on the assumption of greater information efficiency and, hence, minimal ETF impact.

Our study seeks to answer two primary questions:

Does ETF ownership increase the sensitivity of investment decisions to stock prices, as measured by Tobin's q , across firms of different sizes?

And, if so, does the magnitude of this effect vary significantly between small-cap, mid-cap, and large-cap firms?

To explore these questions, we leverage data spanning from 2005 to 2015, categorizing firms by market capitalization and examining the potential differences in investment sensitivity. By testing Antoniou et al.'s assumption about the limited relevance of ETF ownership for large-cap firms, we aim to provide a comprehensive view of how ETFs influence firms with varied characteristics. Specifically, we assess whether large-cap firms exhibit similar investment sensitivity to ETF-driven price informativeness, which would indicate a more pervasive impact of ETFs on investment decisions than previously assumed.

1.1 - Literature Review and Theoretical Background

The impact of ETFs on stock price informativeness and firm investment decisions has been widely debated. ETFs are lauded for their role in enhancing liquidity and promoting efficient price discovery; however, concerns exist about their potential to introduce excessive volatility

and short-termism in corporate decision-making. Some studies, such as Da and Shive (2018), emphasize that ETFs improve price efficiency by aggregating and transmitting macroeconomic and sector-specific information into individual stock prices. This efficiency should, in theory, make it easier for firm managers to rely on market signals in their investment decisions, aligning with the findings of Glosten, Nallareddy, and Zou (2021), who demonstrate that higher ETF ownership correlates with improved price informativeness in firms with less transparent information environments.

However, several researchers argue that ETFs can detract from informational efficiency in individual stocks. Israeli, Lee, and Sridharan (2017) document that increased ETF activity can reduce stock-specific liquidity and affect the informativeness of individual stocks, potentially distorting their role in guiding investment decisions. The aggregation of unrelated information through broad-based index ETFs could introduce noise in stock prices, leading to disconnects between market values and underlying firm fundamentals, especially when ETFs attract substantial noise trading or short-term investors. In contrast, Ben-David, Franzoni, and Moussawi (2018) show that ETFs with high assets under management (AUM) play a substantial role in price discovery due to higher trading volumes and liquidity; ETFs with lower AUM, however, tend to lack significant influence on stock prices or corporate decision-making. This finding is relevant to our analysis, as we exclude low-AUM ETFs to ensure that only ETFs with a meaningful market presence are included in our sample, focusing on those likely to have a substantial impact on the investment behavior of their constituent firms.

Our study takes inspiration from Antoniou et al. (2023), who provide evidence that higher ETF ownership is associated with a greater sensitivity of firms' real investments to Tobin's q . The authors argue that this effect is more pronounced for nonmarket ETFs, which tend to focus on specific sectors or themes rather than broad market indexes. By targeting specific areas, nonmarket ETFs amplify firm- and sector-specific information, enhancing stock price informativeness and making the stock price a more reliable signal for corporate managers making investment decisions. Antoniou et al. further argue that large-cap firms are less impacted by ETF ownership due to their greater market liquidity and analyst coverage, assuming that these firms benefit less from ETF-driven price informativeness. As a result, they exclude large-cap firms from their analysis. In contrast, our study aims to directly examine this assumption by including large-cap firms and testing whether they exhibit increased investment sensitivity to stock prices in the presence of high ETF ownership.

1.2 - Hypothesis Development and Research Focus

Building upon the foundations established by Antoniou et al. (2023) and related studies, our hypothesis is that ETF ownership increases the sensitivity of corporate investment to stock prices (Tobin's q) more significantly for small and mid-cap firms than for large-cap firms, but that large-cap firms may still exhibit some degree of responsiveness. Small-cap firms, which often have lower trading volumes and less analyst coverage, are more likely to experience

informational inefficiencies. ETF ownership in these firms could, therefore, enhance price informativeness, allowing managers to make better-informed investment decisions. Mid-cap firms may also show heightened investment sensitivity as a result of improved price signals driven by ETF ownership, though to a lesser degree than small caps.

While large-cap firms are generally assumed to have higher informational efficiency due to their widespread analyst coverage and greater market capitalization, our study posits that these firms may also experience investment sensitivity to ETF ownership, albeit potentially to a lesser degree. By including large-cap firms in our analysis, we aim to test whether the assumption of minimal ETF impact on large firms holds true or whether ETFs do, in fact, influence investment behavior even in highly liquid, well-covered firms. This examination allows us to extend Antoniou et al.'s (2023) findings by exploring the pervasiveness of ETF-driven price informativeness across a broader range of firm sizes.

1.3 - Methodology and Addressing Endogeneity Concerns

To isolate the causal effect of ETF ownership on investment sensitivity, we employ an instrumental variable (IV) approach to address potential endogeneity. Following Zou (2019), we use BlackRock's acquisition of iShares in 2009 as an exogenous shock to ETF ownership. This acquisition led to increased fund flows into iShares ETFs, making it a natural experiment for analyzing the impact of ETF ownership on firm behavior. By using iShares ownership levels before the acquisition as an instrument, we can better control endogenous factors that might confound the relationship between ETF ownership and investment sensitivity.

In our analysis, we focus on the entry of Fidelity Investments into the ETF market in 2013 as a significant event that reshaped the ETF landscape. This approach leverages a dummy variable that captures the period before and after Fidelity's market entry, coded as 0 for years before 2013, 1 for 2013 and subsequent years. By doing so, we can assess the broader market impact of Fidelity's entry, such as increased competition and awareness of ETFs. This method allows us to utilize existing data on ETF ownership and investment metrics effectively, providing a robust framework to study the general influence of increased ETF accessibility and competition on company investment decisions.

In defining our sample, we focus on ETFs with high AUM, as Ben-David et al. (2018) demonstrate that low-AUM ETFs contribute minimally to price informativeness. By concentrating on large ETFs, we ensure that the ETFs in our sample have sufficient trading volumes and market impact to potentially influence corporate investment behavior. This choice is further supported by the conclusions of Israeli et al. (2017), who found that the effects of ETFs on stock liquidity and information quality are more pronounced in high-trading-volume ETFs, which tend to attract more investor attention and impact stock price behavior more significantly.

1.4 - Contributions and Expected Outcomes

This study contributes to the growing body of literature on the role of ETFs in shaping corporate investment decisions, specifically by challenging the assumption that large-cap firms are immune to the informational impact of ETF ownership. By integrating large-cap firms into the analysis, we offer a more comprehensive understanding of how ETF ownership affects investment sensitivity across firm sizes. Should our findings reveal that large-cap firms are indeed responsive to ETF ownership, it would suggest that the influence of ETFs on corporate investment decisions is more extensive and uniform than previously recognized. In contrast, if our results confirm that ETF ownership affects only small- and mid-cap firms, we will provide empirical support for the assumption held by Antoniou et al. (2023).

In conclusion, our study aims to elucidate the extent to which ETFs impact the investment decisions of firms across the capitalization spectrum, ultimately providing insights that could inform both corporate managers and policymakers regarding the implications of ETF ownership in today's market environment. By challenging existing assumptions and extending prior findings, we seek to contribute to the ongoing dialogue surrounding ETFs' role in modern financial markets

2 - Data

In this section, we describe the data sources, and the calculation of the key variables used in the empirical analysis. We source data from multiple databases, including CRSP and Compustat, accessed via the Wharton Research Data Services (WRDS) platform. CRSP provided comprehensive stock price and ownership data, while Compustat supplied firm-level financial data. We construct ETF ownership of each firm f in year t using the equation:

$$ETF\ Ownership_{f,t} = \frac{\sum_{k=1}^K ETF_Shares_{f,k,t}}{Total_Shares_{f,t}}$$

where $ETF_Shares_{f,k,t}$ represents the number of shares of firm f held by ETF k at time t .

The sample for this study comprises U.S. firms listed on major exchanges, including AMEX, and NASDAQ, for the period between 2005 and 2015. We selected this timeframe given the increased popularity and influence of ETFs in the stock market following the 2008 financial crisis (Wurgler 2011). In addition, focusing on the 2005-2015 period allows this study to build directly upon the analysis presented in Antoniou et al., which employed a similar timeframe. By maintaining consistency, we can draw more precise comparisons and explore potential extensions to their findings. This not only strengthens the empirical foundation of our analysis but also enhances the contribution of our study to the existing literature on ETFs.

To ensure consistency and completeness, we included only firms with continuous data across the 2005-2015 period for all relevant variables. Firms missing critical data points, such as balance sheet information, were excluded to avoid introducing biases due to incomplete observations. This restriction allowed for a thorough examination without the potential distortions caused by missing data.

To compute the necessary variables, we applied specific formulas. Market capitalization, used for size classification, was calculated as the product of the stock price and shares outstanding from CRSP data. ETF ownership for each firm was determined annually by dividing the total shares held by ETFs by the firm's total shares outstanding. This ETF ownership calculation serves as a proxy for the influence ETFs exert on a firm's stock price. Investment was measured as the sum of CapEx and R&D expenses, scaled by total assets, representing a firm's resource allocation toward innovation relative to its size. To investigate specific investment behaviors, we also compute separate measures for CapEx and R&D individually, allowing us to examine any differential effects of ETFs on these two investment components. Tobin's Q, defined as the ratio of a firm's market value to the replacement cost of its assets, is a widely used metric for measuring investment opportunities (Kaplan and Zingales 2000). In the context of our study, Tobin's Q is particularly important for understanding the interaction between ETF ownership and corporate investment. As ETFs influence stock price informativeness through mechanisms such as liquidity provision (Hamm 2014), Tobin's Q serves as a lens through which we can observe these effects. Additionally, its consistent use in prior literature provides a benchmark for comparability, allowing us to extend existing studies on the role of stock price signals. In our analysis, Tobin's Q was calculated as the market value of equity plus the book value of assets minus the book value of equity, scaled by total assets (Asker, Farremensa, and Ljungqvist 2015).

To handle potential outliers, we applied winsorization to all variables at the 1st and 99th percentiles. Finally, to provide an overview of the sample's key characteristics, we computed descriptive statistics for all variables (refer to Exhibit B in the Appendix). The average investment in our sample is 0.60, with a substantial standard deviation of 3.64. This high standard deviation indicates significant variation in investment intensity across firms, consistent with prior findings on diverse investment patterns in firms of different sizes and industries (Fazzari, Hubbard, and Peterson 1988). Notably, the median investment value is much lower at 0.03, suggesting that while some firms invest heavily, the majority maintain relatively modest investment levels. The mean value of Tobin's Q in our sample is 0.025, with a median of zero and a standard deviation of 0.10, suggesting that Tobin's Q is highly skewed in this dataset. A small mean Tobin's Q might indicate that the dataset includes a large proportion of firms with limited market-to-book valuation, which is common among smaller firms (Chung and Pruitt 1994). Finally, ETF ownership has a mean value of 0.42, with a standard deviation of 0.34. The wide variation in ETF ownership across firms implies that while some firms experience

substantial ETF involvement, others remain relatively unaffected by passive ownership. In summary, the substantial variability in investment, Tobin's Q, and ETF ownership across firms sets a strong foundation for examining how ETF presence influences corporate investment behaviors.

3 - Empirical Results

3.1 - Baseline Ordinary Least Squares (OLS) & Control Variables

In this section, we will present our main empirical findings. Our analysis aims to uncover whether the influence of ETF ownership on investment behavior varies across firms of different sizes. To do this, we conduct our baseline regression separately for small-cap, mid-cap, and large-cap firms (see Appendix for complete list), allowing us to capture distinct patterns in investment sensitivity. Specifically, for each firm size category, we estimate the following regression model:

$$Investment_{it} = \alpha_i + \chi_i + \delta_1 Q_{it-1} + \delta_2 Q_{it-1} \times ETF_{it-1} + \delta_3 ETF_{it-1} + \psi X_{it-1} + \epsilon_{it}$$

$Investment_{it}$ represents firm i 's investment in year t . Q_{it-1} is Tobin's Q, representing the firm i 's investment opportunities in year $t - 1$. ETF_{it-1} is the ETF ownership percentage of a firm i 's stock in year $t - 1$. The interaction term $Q_{it-1} \times ETF_{it-1}$ captures the incremental effect of ETF ownership on investment sensitivity. X_{it-1} represents a vector of control variables, including firm size, cash holdings, leverage, and other factors that may affect investment decisions.

The key variable of interest across each size category is the interaction term $Q_{it-1} \times ETF_{it-1}$, which allows us to examine whether ETF ownership modifies the relationship between Tobin's Q and investment differently for small-cap, mid-cap, and large-cap firms.

To ensure robustness, our model includes a range of control variables that capture other factors influencing investment behavior. We control *firm size* and its interaction with Tobin's Q within each size category, as larger firms may have different investment opportunities and reliance on market signals compared to smaller firms (Bushee 1998; Foucault and Frésard 2014). *Cash holdings* (scaled by total assets) are included to control liquidity effects, as cash-rich firms may have greater flexibility in capital allocation (Opler et al. 1999).

3.2 - OLS Results by Firm Size

In the baseline OLS regression, we examine the relationship between the firm's investment decisions, Tobin's Q, and ETF ownership. The baseline regression gives some hints on what

should be expected in the total effect and the isolated effect of each variable can be identified in a clearer way in the following regressions.

Looking at the R square of the baseline regression, we can see that in the Large group, the model can explain under 10% of the variations; in the Mid group, under 35%; in the Small group, under 20%. Therefore, the coefficients in the baseline regression should not be interpreted as evidence for causal relationship, since they suffer from omitted-variable bias and thus lack of explanation power.

3.2.1 - Small-Cap Firms

For small-cap firms, the results reveal a strong and significant sensitivity of investment to Tobin's Q, particularly for total investment and Capital Expenditures (refer to Table 1). These findings highlight the pivotal role that stock prices play in shaping the investment decisions of small-cap firms, which often lack the internal resources and established creditworthiness to rely solely on internal financing (Beck, Demirgüç-Kunt, and Maksimovic 2005). This reliance on Tobin's Q aligns with prior literature emphasizing the heightened importance of external market signals for smaller, resource-constrained firms.

The absence of a significant interaction effect may indicate that the distortions introduced by ETF-driven trading - such as noise in stock price - are not sufficiently pronounced in the small-cap segment to substantially impact investment decisions. Prior research, such as Broman (2016), has highlighted the potential for ETFs to amplify noise in stock valuations, but this phenomenon may be mitigated for small-cap firms due to their limited representation in market indices and relatively lower ETF ownership levels. Thus, the lack of significant coefficients in this context may reflect the minimal impact of ETF-induced noise on these firms' decision-making processes.

Despite these findings, small-cap firms should not entirely disregard the implications of ETF flows. As smaller firms are more likely to suffer more limited visibility and a lack of analyst coverage, they may still benefit from strategies aimed at strengthening relationships with analysts. Such efforts can help ensure that their intrinsic value is accurately captured in stock prices, mitigating any residual distortions caused by ETF flows (Bushee and Miller 2012).

Table 1 – Baseline OLS for Small-Cap Firms

	Baseline OLS			OLS with Controls		
	Investment	R&D	CapEx	Investment	R&D	CapEx
	(1)	(2)	(3)	(4)	(5)	(6)
Tobin's Q	1.202**	-0.152	3.179***	2.740***	0.096	0.134
ETF Ownership	0.106***	-0.002	0.157***	-0.014	0.009	0.045
ETF Ownership: Tobin's Q	3.370	0.148	2.464*	-0.012	-0.020	0.077
Size				-0.007**	-0.001	-0.014***
Size: Tobin's Q				-0.424***	-0.015	0.029
Cash				-0.077*	-0.126***	0.028
Cash: ETF Ownership				0.332***	-0.013	-0.176**
Observations	624	624	624	653	653	653
R ²	0.338	0.004	0.309	0.594	0.843	0.440
Adjusted R ²	0.335	-0.001	0.306	0.526	0.817	0.347
Controls	Excluded	Excluded	Excluded	Included	Included	Included
Fixed Effect	Excluded	Excluded	Excluded	Y, F	Y, F	Y, F

Notes: This table presents the results from the regression of firm investments (Investment, R&D and CapEx) on the interaction of Tobin's Q and ETF ownership for group Small. In the Baseline OLS, none of the control or fixed effects are included. See Appendix B for variable definitions. *p<0.1; **p<0.05; ***p<0.01

3.2.2 - Mid-Cap Firms

In mid-cap firms, Tobin's Q is significant and positively correlated with both Investment and CapEx, indicating that these firms rely on stock price signals for investment decisions, albeit less strongly than small-cap firms (refer to Table 2). This finding aligns with prior literature suggesting that mid-sized firms, while less financially constrained than small-cap firms, still depend on external market conditions due to their moderate access to internal resources (Hadlock and Pierce 2010). The interaction term $Q_{it-1} \times ETF_{it-1}$ is positive and significant for mid-cap firms, suggesting that ETF ownership amplifies the responsiveness of investment to stock price signals. This result may indicate that ETFs enhance market liquidity and price efficiency for mid-cap firms, allowing these firms to better interpret and respond to market valuations when making investment decisions (Madhavan, Ang, and Sobczyk 2018).

Mid-cap firms, which often attract attention from analysts and institutional investors, may benefit disproportionately from the improved liquidity and visibility associated with ETF ownership. This amplification effect could reflect a more accurate incorporation of firm-specific fundamentals into stock prices, which may offset concerns about index-driven noise (Bhushan 1989). However, the increased reliance on Tobin's Q also suggests that mid-cap firms remain exposed to broader market trends and index-level dynamics, which could occasionally override

firm-specific growth signals (Wurgler 2010). This underscores the importance of maintaining strong communication with investors to ensure that intrinsic value remains central to market valuations.

Table 2 – Baseline OLS for Mid-Cap Firms

	Baseline OLS			OLS with Controls		
	Investment	R&D	CapEx	Investment	R&D	CapEx
	(1)	(2)	(3)	(4)	(5)	(6)
Tobin's Q	1.202**	-0.152	3.179***	6.634***	0.030	13.962***
ETF Ownership	0.106***	-0.002	0.157***	-0.061	-0.005	0.105
Ownership: Tobin's Q	3.370	0.148	2.464*	3.223***	-0.063	2.035***
Size				-0.019***	0.0003	-0.027***
Size: Tobin's Q				-0.866***	-0.001	-1.792***
Cash				-0.360***	-0.076***	0.144
Cash: ETF Ownership				0.727***	0.054**	-0.553
Observations	624	624	624	624	624	624
R ²	0.338	0.004	0.309	0.633	0.927	0.645
Adjusted R ²	0.335	-0.001	0.306	0.574	0.915	0.587
Controls	Excluded	Excluded	Excluded	Included	Included	Included
Fixed Effect	Excluded	Excluded	Excluded	Y, F	Y, F	Y, F

Notes: This table presents the results from the regression of firm investments (Investment, R&D, and CapEx) on the interaction of Tobin's Q and ETF ownership for group Mid. In the Baseline OLS, none of the control or fixed is included. In the OLS with Controls, both firm and year fixed effects are included. See Appendix B for variable definitions. *p<0.1; **p<0.05; ***p<0.01

3.2.3 - Large-Cap Firms

For large-cap firms, the coefficient for Tobin's Q in the CapEx regression is both positive and significant, suggesting that higher market valuations relative to book values encourage large-cap firms to allocate more resources toward capital-intensive projects. However, the absence of significant effects on R&D and total investment points to a more limited reliance on stock price signals for decision-making in large-cap firms. This aligns with the characteristics of large firms, which often have stable cash flows, and enhanced access to debt and equity markets, reducing their dependence on market-driven signals such as Tobin's Q for making investment decisions (Whited 1992).

ETF ownership emerges as a key determinant of capital expenditures for large-cap firms, with a significant positive coefficient in the CapEx regression. This finding implies that ETFs play a facilitative role in enhancing liquidity, thereby lowering the cost of capital and enabling

large-cap firms to invest more heavily in capital-intensive activities. This observation aligns with prior research that highlights the liquidity-enhancing effects of ETFs and their ability to reduce transaction costs for large, liquid stocks (Glosten, Nallareddy, and Zou 2021). The results show no significant direct effect of ETF ownership on total investment or R&D, suggesting that the benefits of ETF-driven liquidity are more relevant for tangible, long-term investments.

It is important to note that the interaction term between ETF ownership and Tobin's Q is insignificant across all categories: total investment, R&D, and CapEx. While there are some significant effects for Tobin's Q and ETF ownership individually, the interaction term does not yield any statistically significant results. This indicates that while there may be individual effects of Tobin's Q or ETF ownership on certain types of investment, the joint effect of these variables does not significantly alter the investment behavior for large-cap firms. This insignificance could reflect the reduced reliance of large firms on stock price signals, as well as the potential mitigating effects of ETFs' index-driven trading on the informativeness of Tobin's Q (Belasco, Finke, and Nanigian 2012).

Table 3 – Baseline OLS for Large-Cap Firms

	Baseline OLS			OLS with Controls		
	Investmen t	R&D	CapEx	Investmen t	R&D	CapEx
	(1)	(2)	(3)	(4)	(5)	(6)
Tobin's Q	19.701	-0.064	70.491***	43.919	-0.084	-6.978
ETF Ownership	2.960***	-0.007	5.172***	0.801	-0.010	4.152*
ETF Ownership: Tobin's Q	2.453	0.064	-68.954**	9.413	-0.010	-0.619
Size				-0.628***	-0.002	-1.036***
Size: Tobin's Q				-5.651	0.020	3.931
Cash				-1.716	-0.052**	1.191
Cash: ETF Ownership				-0.833	0.035	-16.101**
Observations	630	630	630	630	630	630
R ²	0.124	0.002	0.053	0.427	0.758	0.505
Adjusted R ²	0.120	-0.003	0.049	0.335	0.719	0.426
Controls	Excluded	Excluded	Excluded	Included	Included	Included
Fixed Effect	Excluded	Excluded	Excluded	Y, F	Y, F	Y, F

Notes: This table presents the results from the regression of firm investments (Investment, R&D and CapEx) on the interaction of Tobin's Q and ETF ownership for group Large. In the Baseline OLS, none of the control or fixed effects are included. See Appendix B for variable definitions. *p<0.1; **p<0.05; ***p<0.01

3.2.4 - Key Takeaways

The results of our analysis provide a nuanced understanding of the interplay between ETF ownership, firm size, and investment sensitivity to stock prices, as measured by Tobin's Q. A notable divergence from Antoniou et al. (2013) lies in the insignificance of the interaction terms across certain categories, particularly for large- and small-cap firms. Antoniou et al.'s findings highlight the capacity of ETFs, especially non-market ETFs, to enhance the sensitivity of investment to stock prices by embedding more precise information into stock prices. Our results suggest that while such effects might exist in aggregate analyses, they may not uniformly extend across all firm sizes. For large firms, this could reflect their diminished reliance on stock prices as investment signals, as their funding strategies are less tied to market dynamics. For small firms, the lack of significant interaction effects might indicate that the noise introduced by ETFs offsets any informational benefits, a finding consistent with studies on ETF-induced volatility (Ben-David, Franzoni and Moussawi 2018).

The findings address our primary research questions. First, ETF ownership does appear to increase the sensitivity of investment to stock prices, but this effect is size-dependent. Second, the magnitude of this effect varies significantly by firm size, with mid-cap firms demonstrating the strongest evidence of enhanced investment sensitivity due to ETF ownership. These results emphasize the importance of size stratification in analyzing the real effects of ETFs, as aggregate analyses may mask these nuanced dynamics.

The insignificance of the interaction terms in large- and small-cap firms, despite theoretical expectations, raises concerns about potential endogeneity. Implementing an instrumental-variable approach could help disentangle these effects and validate the observed size-dependent dynamics.

3.3 - Instrumental Variable Model - BlackRock Acquisition

3.3.1 - Introduction

Addressing endogeneity is critical in understanding the relationship between ETF ownership and corporate investment. Without properly accounting for endogeneity, regression estimates may be biased and unreliable. In the context of our study, one major source of endogeneity is reverse causality. Firms with promising investment opportunities or highly informative stock prices may attract greater ETF ownership, creating a feedback loop. In such cases, it may appear that ETF ownership influences investment decisions when, in reality, firms with strong fundamentals are simply more appealing to ETFs. This dynamic, as highlighted by Ben-David, Franzoni, and Moussawi's 2018 study, underscores the importance of disentangling causality in the context of

passive investing. To address this and ensure the robustness of our findings, we employ an instrumental variable (IV) approach inspired by Zou (2019). This approach leverages the BlackRock acquisition of Barclays Global Investors (BGI) in 2009 as a natural experiment to isolate exogenous variation in ETF ownership.

The acquisition by BlackRock marked a transformative event in the ETF industry. BGI's iShares division was already a leader in the ETF market, but the acquisition by BlackRock provided enhanced branding, expanded distribution channels, and significant economies of scale. As documented by Zou (2019), this strategic acquisition led to a substantial inflow of assets into iShares ETFs. The stocks already held by iShares ETFs prior to the acquisition experienced a notable increase in ETF ownership following the event, creating an exogenous shock to ETF flows. This unique circumstance allows us to use the differential inflows as an instrument to study the causal impact of ETF ownership on investment behavior.

The IV model involves two stages. In the first stage, we estimate ETF ownership and its interaction with Tobin's Q using the instrument $Post_t \times Treat_i$, where $Post_t$ is a dummy for the post-acquisition period (2013-2015) and $Treat_i$ identifies stocks heavily held by iShares ETFs before the acquisition. The predicted values from this stage are then used in the second stage to evaluate their impact on corporate investment.

3.3.2 - Reduced Form Regression

The reduced form regression examines the direct and interaction effects of the instrument on ETF ownership. The equations are specified as:

$$ETF\ Ownership_{it} = \delta_1 (Post_t \times Treat_i) + \delta_2 (Post_t \times Treat_i \times Q_{it-1}) + \delta_3 Q_{it-1} + \psi X_{it-1} + \varepsilon_{it}$$

$$ETF_Ownership_{it} \times Q_{it-t} = \theta_1 (Post_t \times Treat_i) + \theta_2 (Post_t \times Treat_i \times Q_{it-1}) + \theta_3 Q_{it-1} + \psi X_{it-1} + \varepsilon_{it}$$

The interaction term $Post_t \times Treat_i \times Q_{it-1}$ captures how the exogenous increase in ETF ownership affects the sensitivity of ETF flows to Tobin's Q.

3.3.3 - Second-Stage Regression

The second-stage regression evaluates the impact of ETF ownership and its interaction with Tobin's Q on corporate investment. The equation is specified as:

$$\text{Investment}_{it} = \beta_1 Q_{it-1} + \beta_2 \text{ETF_Ownership}_{it} + \beta_3 (\text{ETF_Ownership}_{it} \times Q_{it-1}) + \psi X_{it-1} + \varepsilon_{it}$$

The coefficients β_1 , β_2 , and β_3 represent the sensitivity of investment to Tobin's Q, the direct effect of ETF ownership, and the impact of ETF ownership on investment-Q sensitivity, respectively.

3.3.4 - Results

First, a baseline instrumental variable (IV) regression is performed, incorporating only the variables of interest. This provides an initial estimate of the expected coefficient magnitude. It is important to note that the R-squared values for all three groups are very low, indicating that the coefficients do not significantly contribute to understanding the causal relationship. Therefore, we will refrain from further interpretation of these results.

We then conducted the IV regression with the inclusion of control variables. These models yielded higher R-squared values, indicating improved explanatory power. Consequently, we will proceed to explain these results in detail, as they offer more meaningful insights being examined.

Table 4 – IV for Small-Cap Firms

	Baseline IV			IV with Controls		
	Investment	R&D	CapEx	Investment	R&D	CapEx
	(1)	(2)	(3)	(4)	(5)	(6)
Tobin's Q	0.426***	-0.034	0.453***	2.883***	0.037	0.380
ETF Ownership	-0.019	-0.026	-0.050	-0.021	-0.014	-0.002
ETF Ownership: Tobin's Q	0.051	0.026	0.036	0.005	0.010	0.021
Size				-0.008***	0.001	-0.014***
Size: Tobin's Q				-0.445***	-0.006	-0.002
Cash				-0.104**	-0.086**	0.023
Cash: ETF Ownership				0.347***	-0.074**	-0.199**
Observations	602	602	602	602	602	602
R ²	0.255	0.003	0.188	0.617	0.864	0.463
Adjusted R ²	0.251	-0.002	0.184	0.547	0.839	0.364
Controls	Excluded	Excluded	Excluded	Included	Included	Included
Fixed Effect	Excluded	Excluded	Excluded	Y, F	Y, F	Y, F

Notes: Baseline IV results for small-cap firms examining ETF ownership with controls. *p<0.1; **p<0.05; ***p<0.01

The “IV with Controls” results for small-cap firms (columns 4-6 in Table 4) provide refined insights. Notably, the coefficient for Tobin's Q remains significant and positive for total investment and CapEx, emphasizing the strong reliance of small-cap firms on market signals to guide these investment types. However, for R&D; Tobin's Q is insignificant, consistent with earlier observations in the OLS results that small-cap firms' R&D investments are less tied to market signals.

ETF ownership, as in the OLS results, remains insignificant across all investment categories, suggesting no evidence of a direct impact of ETFs on small-cap firms' investment decisions. Furthermore, the interaction term between ETF ownership and Tobin's Q is also insignificant. This aligns with OLS findings and reinforces the notion that ETFs do not significantly alter the sensitivity of small-cap firms' investment to stock prices. The lack of a significant interaction effect highlights that ETF-driven price signals may not meaningfully influence the investment behavior of small-cap firms.

Table 5 – IV for Mid-Cap Firms

	Baseline IV			IV with Controls		
	Investment	R&D	CapEx	Investment	R&D	CapEx
	(1)	(2)	(3)	(4)	(5)	(6)
Tobin's Q	3.250***	-0.076	4.864***	8.981***	-0.023	15.627***
ETF Ownership	-0.219*	0.024	0.107	-0.005	0.004	0.035
ETF Ownership: Tobin's Q	1.106	0.187	-1.335	-0.987	-0.018	-1.548
Size				-0.015	0.0002	-0.023**
Size: Tobin's Q				-0.957***	0.001	-1.878***
Cash				-0.390***	-0.080***	0.122
Cash: ETF Ownership				0.782***	0.055**	-0.465
Observations	567	567	567	567	567	567
R ²	0.288	0.011	0.280	0.634	0.931	0.653
Adjusted R ²	0.284	0.006	0.276	0.567	0.918	0.590
Controls	Excluded	Excluded	Excluded	Included	Included	Included
Fixed Effect	Excluded	Excluded	Excluded	Y, F	Y, F	Y, F

Notes: IV Regression results for mid-cap firms addressing endogeneity concerns. *p<0.1; **p<0.05; ***p<0.01

In the “IV with Controls” results for mid-cap firms, the coefficient for Tobin's Q remains significant and positive for total investment and CapEx (refer to columns 4-6 in Table 5), emphasizing that mid-cap firms rely heavily on market signals to inform investment decisions, particularly for capital-intensive projects. For R&D, Tobin's Q remains insignificant. ETF ownership, both directly and in interaction with Tobin's Q, is insignificant across all investment categories. This result diverges from our OLS findings, where we observed some significance in the interaction terms for mid-cap firms. These findings indicate that ETF ownership does not significantly alter the sensitivity of mid-cap firms' investment decisions to market signals once endogeneity is controlled for.

Table 6 – IV for Large-Cap Firms

	Baseline IV			IV with Controls		
	Investment	R&D	CapEx	Investment	R&D	CapEx
	(1)	(2)	(3)	(4)	(5)	(6)
Tobin's Q	23.529***	-0.023	20.518***	58.738***	-0.058	-4.829
ETF Ownership	0.267	-0.004	-1.105	-0.106	0.049	7.047
ETF Ownership:	-7.442	0.342	-32.521	8.141	-0.242	-28.974
Tobin's Q						
Size				-0.576***	-0.001	-0.953***
Size: Tobin's Q				-7.103	0.011	3.362
Cash				-2.951	-0.049**	3.410
Cash: ETF Ownership				-0.379	0.034	-17.307**
Observations	572	572	572	572	572	572
R ²	0.095	0.003	0.026	0.451	0.853	0.535
Adjusted R ²	0.090	-0.002	0.021	0.352	0.827	0.452
Controls	Excluded	Excluded	Excluded	Included	Included	Included
Fixed Effect	Excluded	Excluded	Excluded	Y, F	Y, F	Y, F

In the results from the IV regression for large-cap firms (refer to columns 4-6 in Table 6), Tobin's Q retains its significance and impact on total investment, but the magnitude of the coefficients for total investment increases considerably. This shift suggests that the IV approach accounts for endogeneity, providing a clearer picture of the causal relationship between Tobin's Q and investment decisions. Importantly, the IV model shows no significance for R&D, mirroring the OLS results.

ETF ownership exhibits notable differences between the OLS and IV models. In the OLS results, ETF ownership demonstrated a significant positive effect on CapEx, suggesting that ETFs may facilitate investment in tangible assets through enhanced liquidity. However, the IV model finds no significant direct effect of ETF ownership on total investment, R&D, or CapEx. This shift underscores the importance of addressing endogeneity, as the OLS results may have overstated the role of ETF ownership in influencing investment outcomes.

In the OLS model, the interaction term was significant and negative for CapEx, suggesting that ETF ownership dampens the sensitivity of capital expenditures to stock price signals. However, the IV results reveal no significant interaction effects for any investment category.

3.3.5 - Takeaways

A key observation is the consistent insignificance of the interaction terms between ETF ownership and Tobin's Q across all size categories, even after employing the IV approach. This contrasts with prior literature, such as Antoniou et al. (2023), which found significant interaction effects using a more aggregated dataset. The lack of significance in our study implies that, when firm sizes are analyzed separately, the hypothesized dampening effect of ETF ownership on investment sensitivity to Tobin's Q may not be as uniform as suggested in earlier research.

This finding has important implications for our research questions: (1) Does ETF ownership increase the sensitivity of investment decisions to stock prices, as measured by Tobin's Q, across firms of different sizes? (2) If so, does the magnitude of this effect vary significantly between small-cap, mid-cap, and large-cap firms? Our results suggest that ETF ownership does not significantly alter the sensitivity of investment decisions to stock prices when firm sizes are considered separately. The absence of a strong interaction effect points to the possibility that size-specific dynamics, such as liquidity constraints in small-cap firms or the inherent financial resilience of large-cap firms, may moderate the influence of ETF ownership on investment decisions.

Given the insignificance of the interaction terms, we recognized the need for further robustness checks to validate and extend our findings. To this end, we conducted an additional IV test leveraging Fidelity Investments' entry into the ETF market in 2013. By considering this broader market event, we sought to account for any systemic effects of ETFs on investment decisions that may not be captured by firm-specific variations. This additional test also represents a meaningful contribution to the existing literature. Unlike previous studies, which predominantly focus on a single IV approach, our inclusion of the Fidelity IV test demonstrates the importance of exploring multiple exogenous shocks to ETF ownership.

3.4 - Fidelity's Entry

3.4.1 - Background

Building on the results of our initial IV test, which utilized the BlackRock acquisition as a natural experiment, it becomes essential to explore additional sources of exogenous variation in ETF ownership to validate our findings. While the BlackRock IV test offered valuable insights into the relationship between ETFs and corporate investment, the largely insignificant interaction terms across firm sizes in the second-stage regressions suggest the need for further investigation.

To address this, we shift our focus to Fidelity Investments' entry into the ETF market in 2013, an event that significantly reshaped the ETF landscape by expanding investor awareness of ETFs as a tool for portfolio diversification (Huang, Shiyang, O'Hara, and Zhong 2021)

Fidelity's entry was a pivotal moment in the ETF industry, as it disrupted a market previously dominated by players such as BlackRock's iShares and State Street's SPDR. Although Fidelity's ETFs themselves had relatively low assets under management (AUM) during our sample period, the event had a market-wide effect by influencing investor behavior. As highlighted by Israeli, Lee, and Sridharan's 2017 study, market-wide shifts in ETF ownership can influence the broader dynamics of price informativeness and liquidity, making this an event worth analyzing.

By employing the entry of Fidelity as a natural experiment, we can create a dummy variable to capture this event, coded as 0 for years before 2013 and 1 for 2013 and subsequent years. While Fidelity ETFs are not directly included in our dataset due to their low AUM, the broader implications of Fidelity's market entry can still be examined through this approach. This additional IV test provides an opportunity to validate our previous findings and further investigate whether the observed dynamics hold under a different exogenous shock.

3.4.2 - Methodology and Equations

To implement this IV test, we use the following reduced form and second-stage equations. The reduced form regressions examine the impact of Fidelity's entry on ETF ownerships:

$$ETF_Ownership_{it} = \alpha + \beta_1 Fidelity_Dummy_{it} + \beta_2 Controls_{it} + \epsilon_{it}$$

$$Tobin_q_{it} = \alpha + \beta_1 ETF_Ownership_{it} + \beta_2 Fidelity_Dummy_{it} + \beta_3 Controls_{it} + v_{it}$$

Here, the Fidelity Dummy variable equals 1 for the years 2013 and beyond, capturing the broader market impact of Fidelity's entry. Controls include size, leverage, and other firm-level characteristics known to influence investment decisions. The second-stage equation:

$$Investment_{it} = \beta_1 Tobin_q_{it-1} + \beta_2 ETF_Ownership_{it} + \beta_3 (ETF_Ownership_{it} \times Tobin_q_{it-1}) + \psi Controls_{it} + \epsilon_{it}$$

The second-stage regression evaluates the impact of predicted ETF ownership and its interaction with Tobin's Q on corporate investment, replicating the structure of our earlier IV test.

3.4.2 - Results and Takeaways

Table 7 – Fidelity IV for Small-Cap Firms

	Investment	R&D	CapEx
	(1)	(2)	(3)
Tobin's Q	2.883***	0.037	0.380
ETF Ownership	-0.021	-0.014	-0.002
ETF Ownership: Tobin's Q	0.005	0.010	0.021
Size	-0.008***	0.001	-0.014***
Size: Tobin's Q	-0.445***	-0.006	-0.002
Cash	-0.104**	-0.086***	0.023
Cash: ETF Ownership	0.347***	-0.074**	-0.199**
Fidelity	0.001	0.002	0.010
Observations	602	602	602
R ²	0.617	0.864	0.463
Adjusted R ²	0.547	0.839	0.364
Controls	Included	Included	Included
Fixed Effect	Y, F	Y, F	Y, F

Notes: IV regression results for small-cap firms, incorporating controls for Fidelity's ETF presence. *p<0.1; **p<0.05; ***p<0.01

Table 8 – Fidelity IV for Mid-Cap Firm

	Investment	R&D	CapEx
	(1)	(2)	(3)
Tobin's Q	8.981***	-0.023	15.627***
ETF Ownership	-0.005	0.004	0.035
ETF Ownership: Tobin's Q	-0.987	-0.018	-1.548
Size	-0.015**	0.0002	-0.023**
Size: Tobin's Q	-0.957***	0.001	-1.878***
Cash	-0.390***	-0.080***	0.122
Cash: ETF Ownership	0.782***	0.055**	-0.465
Fidelity	-0.039	0.001	-0.003
Observations	567	567	567
R ²	0.634	0.931	0.653
Adjusted R ²	0.567	0.918	0.590
Controls	Included	Included	Included
Fixed Effect	Y, F	Y, F	Y, F

Notes: IV regression results for mid-cap firms factoring in Fidelity's ETF market entry. *p<0.1; **p<0.05; ***p<0.01

Table 9 – Fidelity IV for Large-Cap Firms
Controlling for Fidelity

	Investment	R&D	CapEx
	(1)	(2)	(3)
Tobin's Q	58.738***	-0.058	-4.829
ETF Ownership	-0.106	0.049	7.047
ETF Ownership: Tobin's Q	8.141	-0.242	-28.974
Size	-0.576***	-0.001	-0.953***
Size: Tobin's Q	-7.103**	0.011	3.362
Cash	-2.951	-0.049**	3.410
Cash: ETF Ownership	-0.379	0.034	-17.307**
Fidelity	0.483	-0.015**	0.987
Observations	572	572	572
R ²	0.451	0.853	0.535
Adjusted R ²	0.352	0.827	0.452
Controls	Included	Included	Included
Fixed Effect	Y, F	Y, F	Y, F

Notes: IV results for large-cap firms controlling Fidelity's ETF market entry. *p<0.1; **p<0.05; ***p<0.01

The Fidelity IV results reveal distinct patterns across firm sizes. For small-cap firms, the results indicate a strong and positive relationship between Tobin's Q and total investment (refer to Table 7). This finding reinforces the reliance of smaller firms on market signals to guide investment decisions. However, ETF ownership, whether direct or in interaction with Tobin's Q, remains insignificant. Mid-cap firms exhibit a similar trend, where Tobin's Q retains its strong positive association with total investment (see Table 8). Interestingly, for mid-cap firms, the cash variable interacts positively with ETF ownership, indicating that access to liquidity amplifies positive impact of ETFs. Large-cap firms continue to show muted sensitivity to Tobin's Q for most categories except total investment (refer to Table 9). The direct effect of ETF ownership and its interaction with Tobin's Q remains insignificant across the board.

The persistence of insignificant interaction terms across all firm sizes in the Fidelity IV results further underscores a key finding of this study: the hypothesized impact of ETF ownership on investment sensitivity to Tobin's Q, as seen in Antoniou et al's 2023 study, does not materialize in our analysis. This outcome may indicate that the mechanisms through which ETFs influence corporate investment decisions are more nuanced. While the direct effects of ETFs on total investment are often minor, the results suggest that firm-specific characteristics, such as size, play a much larger role in mediating investment behavior.

Section 4 - Non-Market and Market ETFs

4.1 - Importance of Incorporating the Distinction

Market ETFs, by design, track broad indices, aggregating a wide array of stocks across industries, firm sizes, and geographies. This breadth makes them effective tools for diversification but also introduces potential distortions to stock price signals (Petajisto 2011). Market ETFs are often driven by aggregate market flows rather than firm-specific fundamentals, amplifying the role of noise traders (Calamia and Meloso 2024). In contrast, non-market ETFs—those focused on specific sectors, industries, or themes—offer a narrower scope, enabling them to channel more precise, sector specific information into stock prices (Belasco, Finke, and Nanigian 2012).

In our study, we will explicitly differentiate between market and non-market ETFs to investigate their unique effects on investment behavior. This distinction is vital, as the breadth of market ETFs and the precision of non-market ETFs produce contrasting dynamics that can significantly alter how stock prices inform firm decisions. Understanding these differences is crucial for evaluating the pathways through which ETFs impact corporate investment.

In addition to their systematic implications, market and non-market ETFs also differ in how they influence firm-level visibility and investor engagement. Market ETFs, which aggregate large numbers of stocks, often provide less visibility to individual firms, particularly smaller ones. In contrast, non-market ETFs can enhance visibility for firms within their focused sectors, drawing attention from analysts and investors who specialize in those areas (Ben-David, Franzoni, and Moussawi 2018). Bhushan (1989) demonstrated that analyst coverage is a critical component of price informativeness. Even though Antoniou et al. (2023) explored the distinction between market and non-market ETFs, it remains critical to reexamine this divide within our context of size-based firm categorization.

4.2 - Methodology

To analyze the differential impacts of market and non-market ETFs, our methodology was directly inspired by recent advancements in understanding the informational dynamics of ETFs, particularly the frameworks established by Zou (2019) and Madhavan, Ang, and Sobczyk (2018).

In our dataset, we observed a distinct pattern in how firms of different sizes interacted with ETFs. Large-cap firms were predominantly held by non-market ETFs, likely reflecting their established roles in key industries and their appeal to thematic investors seeking exposure to

specific sectors (Dessaint, Foucault, and Matray 2019). These firms tend to dominate their respective markets, making them ideal candidates for non-market ETFs focused on targeted industry groups or growth themes. Mid-cap firms, by contrast, exhibited significant exposure to market ETFs. This is consistent with their transitional position between liquidity-constrained small firms and highly visible large firms, where they benefit from the broad exposure provided by market ETFs but still lack the focused attention drawn by non-market ETFs. Small-cap firms, on the other hand, were almost entirely held by market ETFs. This pattern aligns with the broader trend of index funds including small-cap firms primarily as part of their diversification strategies (Bhojraj, Mohanram, and Zhang 2022). The clear distinctions in the levels of exposure to market and non-market ETFs within our dataset serve as a strong foundation for conducting an analysis that explicitly differentiates between these two ETF categories.

Since a firm can only be categorized into one type of ETF ownership at a time, the sum of market and non-market ETF ownership necessarily equals the total ETF ownership. As a result, including both categories in the regression would introduce multicollinearity, rendering the regression coefficients difficult to interpret. This issue arises because market and non-market ETF ownership are inversely proportional by definition—an increase in one category directly corresponds to a decrease in the other. To address this, we chose to include only non-market ETFs in our regression models. The coefficients in our regression, while representing the impacts of non-market ETFs, are mathematically equivalent to what would be observed for market ETFs, but with opposite signs.

Our regression model incorporated non-market ETF ownership as both a standalone variable and an interaction term with Tobin's Q. This approach builds on the instrumental variable framework used earlier in our study, leveraging the BlackRock acquisition of BGI as an exogenous shock to ETF ownership. By instrumenting non-market ETF ownership, we ensured that our findings were not biased by endogeneity concerns. The regression specification is given by:

$$Investment_{it} = \beta_1 Q_{it-1} + \beta_2 NMEO_{it} + \beta_3 (NMEO_{it} \times Q_{it-1}) + \psi X_{it-1} + \varepsilon_{it}$$

$NMEO_{it}$ captures the proportion of a firm i 's stock held by non-market ETFs.

4.3 - Results

The results of our analysis reveal significant variations in the impact of market and non-market ETFs across different investment categories.

Table 10 - OLS for Large when distinguishing between Market/Non-Market

	Investment	R&D	CapEx
	(1)	(2)	(3)
Tobin's Q	13.183	-0.548	-31.634
ETF Ownership	0.705	-0.012	4.076*
ETF Ownership: Tobin's Q	7.892	-0.033	-1.840
Size	-0.637***	-0.002	-1.044***
Size: Tobin's Q	-5.974	0.015	3.672
Cash	-1.530	-0.049*	1.341
Cash: ETF Ownership	-0.225	0.044	-15.614**
Non-market: Tobin's Q	33.767	0.510*	27.088
Observations	630	630	630
R ²	0.427	0.759	0.505
Adjusted R ²	0.334	0.720	0.425
Controls	Included	Included	Included
Fixed Effect	Y, F	Y, F	Y, F

Notes: OLS results highlighting the distinction between market and non-market ETFs for large-cap firms. *p<0.1; **p<0.05; ***p<0.01

For large-cap firms, the coefficient for non-market ETFs in the R&D investment regression is negative (see Table 10). This finding aligns with the notion that non-market ETFs can exacerbate distortions in price informativeness for these firms. Large firms, often characterized by greater liquidity, may see their stock prices increasingly dominated by industry-specific trends amplified by non-market ETFs.

Table 11 – OLS for Mid when distinguishing between Market/Non-Market

	Investment	R&D	CapEx
	(1)	(2)	(3)
Tobin's Q	7.321***	0.029	14.085***
ETF Ownership	-0.050	-0.005	0.107
ETF Ownership: Tobin's Q	3.389***	-0.064	2.065*
Size	-0.019***	0.0003	-0.027***
Size: Tobin's Q	-1.127***	-0.001	-1.839***
Cash	-0.302**	-0.076***	0.154
Cash: ETF Ownership	0.663***	0.054**	-0.564
Non-market: Tobin's Q	4.547***	-0.008	0.816
Observations	624	624	624
R ²	0.690	0.927	0.645
Adjusted R ²	0.639	0.915	0.587
Controls	Included	Included	Included
Fixed Effect	Y, F	Y, F	Y, F

Notes: OLS results for mid-cap firms comparing market and non-market ETFs. p<0.1; **p<0.05; ***p<0.01

In mid-cap firms, the results indicate a more positive interaction between Tobin's Q and non-market ETF ownership for R&D investments (refer to Table 11). This result suggests that mid-cap firms leverage the informational precision of non-market ETFs when aligning their investments with market expectations. Interestingly, while this interaction term is significant for total investment, it is not significant for R&D or CapEx when examined separately, suggesting that the channeling of sector-specific information has a more pronounced aggregate impact on overall investment rather than on disaggregated expenditure types.

On the other hand, the lack of significant direct effects of ETF ownership (-0.050 for total investment, -0.005 for R&D, and 0.107 for CapEx) suggests that market ETFs, which track broad indices, do not provide the same level of targeted informational benefits. Given that total ETF ownership reflects a combination of market and non-market ETFs, its lack of significance may suggest that the negative effects of market ETFs cancel out the positive effects of non-market ETFs for mid-cap firms. However, we emphasize that this conclusion about market ETFs is inferred indirectly based on our non-market-focused results and requires further direct investigation.

For small-cap firms, however, the role of non-market ETFs is less pronounced. The coefficients for non-market ETF ownership and its interaction with Tobin's Q are insignificant across all investment categories (see Table 12), suggesting limited direct influence on small-cap investment behavior. This could reflect the broader index-based inclusion of these firms in market ETFs, which dominate their ownership profiles.

Table 12 – OLS for Small when distinguishing between Market/Non-Market

	Investment	R&D	CapEx
	(1)	(2)	(3)
Tobin's Q	2.740***	0.096	0.134
ETF Ownership	-0.014	0.009	0.045
ETF Ownership: Tobin's Q	-0.012	-0.020	0.077
Size	-0.007**	0.001	-0.014***
Size: Tobin's Q	-0.424***	-0.015	0.029
Cash	-0.077*	-0.126***	0.028
Cash: ETF Ownership	0.332***	-0.013	-0.176**
Non-market: Tobin's Q	NA	NA	NA
Observations	653	653	653
R ²	0.594	0.843	0.440
Adjusted R ²	0.526	0.817	0.347
Controls	Included	Included	Included
Fixed Effect	Y, F	Y, F	Y, F

Notes: OLS results for mid-cap firms comparing market and non-market ETFs. p<0.1; **p<0.05; ***p<0.01

Our findings partially echo the conclusions of Antonio et al. (2023), who demonstrated that non-market ETFs enhance the incorporation of industry-specific information into stock prices. However, the differentiated impact observed across firm sizes in our study extends the understanding of these dynamics. One significant deviation from Antoniou et al's findings is the negative impact of non-market ETFs on R&D investments in large-cap firms. This suggests that the potential for non-market ETFs to improve informational efficiency may be context dependent. It underscores the importance of considering firm-specific characteristics when evaluating the role of non-market ETFs.

Our results reaffirm the critical importance of distinguishing between market and non-market ETFs when studying their impact on corporate investment. While market ETFs primarily serve as instruments for diversification, non-market ETFs play a more complex role in shaping price informativeness. The contrasting dynamics observed across firm sizes emphasize the need for tailored approaches to understanding ETF effects.

5 - Discussion

The findings of this study provide new insights into the complex interplay between ETF ownership and corporate investment decisions, particularly through the lens of firm size and the distinction between market and non-market ETFs. By examining these dynamics, we shed light on how ETFs influence real economic outcomes, extending the literature on financial markets' informational efficiency.

5.1 - Limitations

While the study employs two distinct IV approaches to address endogeneity concerns and ensure the robustness of our findings, the absence of significant interaction terms across firm sizes in both IV tests raises important limitations that warrant further consideration. While the study addresses endogeneity through two distinct IV approaches, the absence of significant interaction effects may indicate that the hypothesized causal pathway - where ETF ownership amplifies the sensitivity of investment decisions to Tobin's Q - operates indirectly or is contingent on additional moderating factors not captured in our models.

The study's focus on ETFs with high AUM, while ensuring that we captured instruments with substantial market impact, may have introduced sample bias. By excluding smaller ETFs, particularly those with thematic or emerging market focuses, we may have overlooked important variations in ETF dynamics that could influence price informativeness. The omission of these ETFs could lead to an incomplete understanding of the ways in which ETF ownership impacts smaller, less visible firms or specific sectors of the economy.

Our analysis is also limited by the available timeframe and data coverage, particularly for the Fidelity test. Fidelity ETFs were not included in the dataset due to their relatively low AUM during the period under study, and their broader market impact is captured only indirectly through a dummy variable. While this approach aligns with previous research methods, it does limit the granularity of our findings. Future research could include additional datasets to explore how Fidelity ETFs - and similar competitive entrants - shape long term dynamics in corporate investment and price informativeness.

An additional limitation stems from the inherent complexity of isolating the specific effects of market and non-market ETFs within a rapidly evolving financial ecosystem. While our study provides a framework for understanding these distinctions, the categorization of ETFs into market and non-market types is itself a simplification that may not fully capture the nuances of how ETFs operate in practice. Many ETFs, particularly those that track hybrid indices, may

exhibit characteristics of both market and non-market ETFs, blurring the lines between these categories. This overlap could introduce measurement error into our analysis, potentially affecting the precision of our estimated coefficients. Future studies could explore more refined categorizations or incorporate additional variables to better capture the multifaceted nature of ETF ownership and its effects on firm-level outcomes.

5.4 - Implications for Theory and Practise

The findings have important implications, particularly in understanding the evolving role of passive investing in modern financial markets. From a theoretical perspective, the study challenges the assumption that ETFs uniformly enhance price informativeness. Instead, it presents a more nuanced view, where the effects of an ETF are contingent on their structure, and the characteristics of the firms they target. This calls for a rethinking of theoretical models that treat passive investment as a homogenous phenomenon.

For practitioners, the findings highlight the critical need for nuanced strategies in navigating an ETF-dominated market. As market ETFs often dilute firm-specific information through their focus on aggregate flows, managers must prioritize fostering deeper engagement with investors and analysts to bridge potential informational gaps. For firms included in non-market ETFs, the thematic focus of these funds presents an opportunity to align corporate strategies with prevailing investor priorities. By actively leveraging their inclusion in non-market ETFs, firms can position themselves as leaders within targeted niches.

6 - Conclusion

This study contributes to the understanding of how ETFs influence corporate investment decisions by examining the nuanced effects of firm size and distinguishing between market and non-market ETFs. The findings underscore the varied impact of ETFs across size categories. Additionally, the differentiation between market and non-market ETFs highlights contrasting dynamics, where non-market ETFs channel targeted information, while market ETFs often dilute firm-specific signals. Although the results raise questions about the broader implications of ETF-driven dynamics - particularly the insignificance of interaction terms in our IV analyses - they establish a framework for future research to refine these relationships.

AI-Disclosure

The AI tool *ChatGPT* was **solely** used to improve the quality of our writing. It served as an advanced grammar checker.

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7 - Appendix

Exhibit A - Variable Definitions

1/Asset: The reciprocal of total asset at the fiscal year-end

CapEx: Capital expenditures at fiscal year-end divided by the beginning-of-year total assets

Cash: The ratio of cash and cash equivalent to total assets

ETF Ownership: Firm ownership by U.S. equity ETFs at the fiscal year-end

Investment: The sum of capital expenditures and R&D expenses at the fiscal year-end divided by the beginning-of-year total assets

Market ETF: Firm ownership by U.S. equity market ETFs at the fiscal year-end. Market ETFs include those that physically track broad market indexes, including S&P 500, S&P 1500, Russell 1000, Russell 3000, and NYSE/NASDAQ Composite Index

Non-market: A dummy variable indicating firm ownership by U.S. equity ETFs at the fiscal year-end not classified as Market ETFs at the fiscal year-end

R&D: R&D expenses at the end of fiscal year divided by the beginning-of-year total assets

Size: The natural logarithm of the firm's market capitalization at the fiscal year-end

Tobin's Q: The market value of equity plus the book value of assets minus the book value of equity scaled by total assets

Exhibit B - Summary Statistics

Panel A-D report summary statistics for the main variables used in the analysis (see Appendix A for variable definitions).

Panel A. Summary statistics of main variables (Combined)

Variables	N	Mean	Q1	Median	Q3	SD
Investment	1907	0.60	0.00	0.03	0.15	3.64
CapEx	1907	0.85	0.00	0.03	0.19	6.14
R&D	1907	0.06	0.01	0.02	0.06	0.09
Tobin's Q	1907	0.03	0.00	0.00	0.02	0.10
ETF	1907	0.42	0.17	0.33	0.65	0.34
Ownership						
Cash	1907	0.16	0.06	0.12	0.21	0.16
Size	1907	7.96	6.60	7.74	9.33	1.89
1/Asset	1907	0.00	0.00	0.00	0.00	0.00

Panel B. Summary statistics of main variables (Large)

Variables	N	Mean	Q1	Median	Q3	SD
Investment	630	1.67	0.33	0.19	0.98	6.18
CapEx	630	2.38	0.05	0.22	1.01	10.52
R&D	630	0.05	0.01	0.03	0.06	0.07
Tobin's Q	630	0.02	0.00	0.01	0.02	0.08
ETF	630	0.42	0.17	0.33	0.63	0.35
Ownership						
Cash	630	0.15	0.05	0.11	0.21	0.14
Size	630	7.92	6.51	7.76	9.30	1.84
1/Asset	630	0.00	0.00	0.00	0.00	0.00

Panel C. Summary statistics of main variables (Mid)

Variables	N	Mean	Q1	Median	Q3	SD
Investment	624	0.11	0.00	0.02	0.09	0.26
CapEx	624	0.14	0.01	0.03	0.10	0.38
R&D	624	0.04	0.01	0.02	0.04	0.05
Tobin's Q	624	0.02	0.00	0.00	0.02	0.04
ETF Ownership	624	0.42	0.17	0.32	0.67	0.30
Cash	624	0.14	0.06	0.12	0.19	0.12
Size	624	7.97	6.68	7.76	9.25	1.92
1/Asset	624	0.00	0.00	0.00	0.00	0.00

Panel D. Summary statistics of main variables (Small)

Variables	N	Mean	Q1	Median	Q3	SD
Investment	653	0.04	0.00	0.01	0.03	0.12
CapEx	653	0.04	0.00	0.01	0.02	0.15
R&D	653	0.08	0.01	0.03	0.09	0.12
Tobin's Q	653	0.04	0.00	0.00	0.01	0.15
ETF Ownership	653	0.42	0.17	0.32	0.66	0.37
Cash	653	0.20	0.06	0.13	0.25	0.19
Size	653	7.78	6.59	7.72	9.38	1.90
1/Asset	653	0.00	0.00	0.00	0.00	0.00