The Costs of ETF Membership: The Valuation Effect of ETFs on Underlying Firms

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Abstract

In this paper, we investigate the effect of exchange traded funds (ETFs) on the value of their underlying stocks and the channels through which ETFs have an impact on firm value. We find that ETFs negatively affect firm value but also have a positive impact on underlying stocks' systematic volatility, short interest, and liquidity. These effects of ETF on firm value and stock characteristics are more pronounced for small firms. We further find that the positive effects of ETFs on these stock characteristics are the main channels through which ETFs negatively impact firm value. Although stock liquidity is known to have a positive effect on firm value, increases in stock liquidity driven by ETFs have a negative effect on firm value because these increases facilitate short-selling activities by investors.

Exchange traded funds (ETFs), exchange-traded assets that represent a basket of securities comprising a particular index, are the most recent and innovative development in the evolution of indexed products. ETFs are traded at lower transaction costs than mutual funds and can be sold short, which facilitates speculation and arbitrage. They are also tax efficient since investors can avoid potential tax liabilities resulting from the redemptions of other investors. Since the first ETF—the SPDR S&P 500 by State Street Corporation—in 1993, the ETF industry has undergone spectacular growth. The total net assets held by ETFs increased from approximately $100 billion in 2002 to almost $900 billion in 2010 (see Figure 1). Similarly, the number of equity ETFs increased from 100 to almost 1,000 during the same period, and the ratio of aggregate ETF dollar trading volume to the total dollar trading volume of all securities in the Center for Research in Security Prices (CRSP) has increased from 10% to about 30% (see Figure 2).

Despite this explosive growth of the ETF market over the past two decades and its significant effects on the trading environment, we know little about its effects on the value of underlying stocks and the channels through which such valuation effects take place. While previous studies have examined the performance of ETFs, their pricing, and the effect of their introduction on the liquidity of underlying stocks,[1] no study to date has examined their valuation effects. Our paper fills this gap in the literature by investigating whether and how ETFs affect the value of underlying stocks.

There are two competing views on the effect of ETFs on firm value: 1) ETFs adversely affect the value of the stock issuers (the negative view) and 2) ETFs have a positive effect on the value of the stock issuers (the positive view). According to the negative view, the significant rise in ETF trading has increased the systematic risk of the underlying stocks, which adversely affects firm value. Prior studies

[1] For example, Elton, Gruber, Comer, and Li (2002) analyze ETF returns in relation to changes in its net asset value; Poterba and Shoven (2002) examine the tax consequences of holding ETFs; Engle and Sarkar (2002) investigate the pricing of ETFs and deviation of price from net asset value; Yu (2005) documents the effect of ETF markets on price formation and informational efficiency of component stock markets; Kurov and Lasser (2002) study the effect of ETF introductions on stock futures markets; Boehmer and Boehmer (2003) examine the costs and market structure of ETF trading; and Crowford, Hansen, and Price (2009) document the effect of the rise of ETFs on the measure of market anomalies. Hegde and McDermott (2004) investigate the effect of the introduction of ETFs on stock liquidity, while Hamm (2010) examines the effect of ETF holdings on the adverse selection cost of stock trading. Ben-David, Franzoni, and Moussawi (2011) examine whether arbitrageurs propagate liquidity shocks between ETFs and underlying stocks.

show that a firm's systematic risk increases upon inclusion in an index comprising a basket of stocks. For example, Vijh (1994) and Barberis, Shleifer, and Wurgler (2005) find that addition to the S&P 500 index leads to an increase in market beta. Using the data on 40 developed and emerging markets, Claessens and Yafeh (2011) find that firms that had been added to major indices experience increases in stock price comovement. Barberis, Shleifer, and Wurgler (2005) argue that frictions and irrational investors in economies can cause comovement in stock prices that is delinked from comovement in fundamentals. Like stock indices, since ETFs facilitate investors' trading in a basket of securities, inclusion of stocks in ETFs can cause an increase in price comovement even without comovement in fundamentals. Consistent with this view, Da and Shive (2012) find that higher turnover of an ETF's shares is associated with more contemporaneous comovement of its underlying equities.

Another reason for the negative effect of ETFs on underlying stock prices is that their presence increases the supply of shares to sell short. Unlike mutual fund managers who profit from management fees, ETF sponsors generally charge very low management fees. However, they can still make a lucrative business from ETF sponsorship by generating large revenues from lending stocks to short sellers.[2] Given the strong incentives of ETF sponsors to lend underlying stocks to short sellers, the rise of ETFs increases the total supply of stocks for short sales.

In contrast, the positive view suggests that ETFs increase firm value by improving stock liquidity. Several studies show that the inception of ETFs has improved the liquidity of underlying stocks. For example, similar to the previous finding that index inclusion leads to an increase in the liquidity of the added stocks (Hegde and McDermott (2003)), Yu (2005), Hegde and McDermott (2004), Richie and Madura (2007), and Winne, Gresse, and Platten (2011) find that the liquidity of underlying stocks improves after the inception of ETFs. As stock liquidity reduces expected return (Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), Brennan, Chordia, and Subrahmanyam (1998), Datar, Naik, and Radcliffe (1998), and Fiori (2000)), taken together, these results suggest that the improvement in stock liquidity caused by the rise of ETFs has a positive effect on firm value.

[2] See "Profit Potential of ETFs Revealed; Comment," *Financial Times,* 25 July 2011.

In sum, the increased use of ETFs can negatively affect the value of their underlying stocks through their effects on the systematic risk of these stocks and the supply of shares to sell short. Alternatively, the increased use of ETFs can have a positive effect on the value of their underlying stocks through their effects on stock liquidity. The dominating effect of ETFs on firm value remains an empirical question.

We find that our results are largely consistent with the negative view of ETFs. Specifically, using the proportion of shares held by all ETFs as the measure of ETF availability (hereafter "ETF holdings"), we find that ETF holdings have a significantly negative impact on firm value during the eight-year sample period from the fourth quarter of 2002 to the third quarter of 2010. We find significant decreases in both Tobin's *q* and industry-adjusted Tobin's *q* subsequent to ETF inceptions. The mean Tobin's *q* drops by 4.2% in the first year after the ETF inception. The magnitude of the decrease in industry-adjusted Tobin's *q* is even more striking: 11.9% during the same period. One could argue that the negative effect of ETF holdings on underlying firms' value subsequent to ETF inception is driven by the fact that investors who anticipate ETF inception accumulate underlying firms' shares prior to inception and sell the shares afterwards, leading to an increase (a decrease) in firm value before (after) ETF inception. However, we find no such evidence of firm value changes around ETF inception.

Next, to investigate the channels through which ETFs affect firm value, we examine how ETF holdings affect the characteristics of its underlying stocks, such as systematic risk, short interest, and liquidity. We find that the systematic risk of small firms increases with ETF holdings. We also find that ETF holdings significantly increase the underlying firms' short interest and stock liquidity, especially for small firms.

We then examine how the changes in these stock characteristics caused by the changes in ETF holdings affect firm value. We find that the increases in systematic risk and short interest induced by ETF holdings are the important channels through which ETF holdings negatively impact firm value. Although increases in stock liquidity generally have a positive effect on firm value, surprisingly, we find that the increases in liquidity induced by ETF holdings have negative impact on firm value. Specifically, when we decompose the change in stock liquidity into ETF-related and non-ETF-related components, we find that

while the increase in stock liquidity due to a non-ETF-related component has a positive effect on firm value, the increase in stock liquidity due to an ETF-related component has a negative effect. A further analysis shows that the increase in stock liquidity due to an ETF-related component induces unusually high short-selling activities in underlying stocks, resulting in a decrease in firm value. These results suggest that the increase in stock liquidity caused by the rise of ETFs negatively affects firm value mainly through ETFs' positive effect on short-selling activities.

Finally, we perform several tests to examine whether the negative effect of ETFs on firm value is more pronounced when firms are overvalued, in which case the increases in the supply of stocks for short sales led by the change in ETF holdings is expected to have a more adverse effect on firm value. First, following Rhodes-Kropt, Robinson, and Viswanathan (2005), we decompose Tobin's q into two components—the ratio of the market value of assets to the intrinsic value of assets and the ratio of the intrinsic value of assets to the book value of assets, and examine which component of Tobin's q is negatively affected by ETF holdings. To the extent that stock overvaluation, if it exists, can be associated with only the market-to-intrinsic ratio, we expect ETF holdings to have a negative impact mainly on the market-to-intrinsic ratio. Consistent with this expectation, we find that ETF holdings have a negative effect only on the market-to-intrinsic ratio, but not on the intrinsic-to-book ratio. Furthermore, the negative effect of ETF holdings on firm value exists only among small firms. Second, we examine whether the change in ETF holdings affects a firm's stock repurchase activities. An important corporate policy implication of the negative valuation effect of ETFs is that if firms buy back their shares when the stock prices are relatively low, then they will engage stock repurchases more actively subsequent to increase in ETF holding. We find the evidence that this is indeed the case, particularly for small firms, suggesting that the change in value induced by ETF holdings has a significant effect on firms' financing policies.

Our paper contributes to the literature by providing the first evidence on the adverse effect of ETF holdings on the value of their underlying stocks. Although previous papers examine how the introduction of derivatives affects the value of their underlying securities, their results are inconclusive. For example,

Conrad (1989), Detemple and Jorion (1990), and Sorescu (2000) show that option introduction has a positive valuation effect before 1982. They interpret this positive valuation effect as evidence that options increase market completeness. On the other hand, Danielsen and Sorescu (2001) show that the valuation effect of option introduction becomes negative after 1982 and argue that this negative valuation effect is largely due to the fact that option introduction relaxes short sale constraints on the underlying stocks. Our evidence that ETF holdings negatively affect the value of underlying stocks through increased short-sale activities is consistent with the view that derivatives relax the short-sale constraints on underlying securities.

Our paper also makes several additional contributions to the literature by providing new insights on important issues related to ETFs. First, our study extends the literature on whether index inclusion is valuable for firms. Harris and Gurel (1986), Shleifer (1986), Lynch and Mendenhall (1997), and Kaul, Mehrotra, and Morck (2000) find that firms experience a significant increase in their stock prices after their inclusion into the S&P 500 index. They attribute the increase in stock price to the upward price pressure caused by the positive shock in demand for the stocks. Not surprisingly, both academics and corporate managers have long viewed index inclusion as desirable for its positive effect on stock liquidity and demand from institutional investors. However, our results show that the rise of ETFs actually hurts firm value, suggesting that index inclusion is not always beneficial to firms. Recently, some practitioners express concerns over the potential negative effect of ETF inclusion on small firms and argue that regulators should allow small firms to opt out of ETF inclusion (Bradley and Litan (2010)). Our results confirm the validity of this concern by providing direct evidence of the negative effect of EFTs on firm value.

Second, our study adds new evidence to the literature that examines the effect of ETFs on underlying stocks' liquidity. Yu (2003) and Hegde and McDermott (2004), among others, find that underlying stocks' liquidity improves after ETF inceptions and interpret this result as the evidence that the stock market benefits from ETFs. Unlike these studies, we find that the increase in stock liquidity caused by the rise of

ETFs provides short sellers with better trading environments for their short-sale activities, which adversely affects firm value.

Third, our study identifies a conflict of interest in the ETF industry and uncovers a nontrivial hidden cost of having ETFs. While the proponents of ETFs argue that ETFs are a low-cost alternative to conventional mutual fund investments, our results suggest that ETF investors and the shareholders of its underlying stocks could suffer from the increase in the supply of their stocks for short sales. Insofar as ETF sponsors have strong incentives to lend underlying stocks to short sellers to make profits, this conflict of interest can result in a potential wealth transfer from ETF investors and the shareholders of underlying shares to ETF sponsors and short sellers.

Finally, regulators have become increasingly concerned about the potential risks of having ETFs, particularly their impact on market volatility.[3] By providing firm-level evidence that ETFs increase the systematic volatility of the underlying firms and thereby decrease firm value, our paper offers direct evidence in support of this concern and calls for future research on the risks of introducing ETFs.

The rest of the paper is organized as follows. In Section I, we describe the data, the construction of our key variables, and summary statistics. In Section II, we present evidence that ETFs have a negative impact on the value of their underlying stocks. In Sections III and IV, we investigate the effect of ETFs on the underlying stocks' characteristics and how the changes in stock characteristics caused by ETFs contribute to the changes in firm value, respectively. Section V examines the impact of ETFs on stock repurchase activities. Section VI presents the results of robustness tests. Finally, we summarize our findings and make concluding remarks in Section VII.

I. Data, variable construction, and summary statistics

In this section, we describe the data, the construction of variables used in the regression analyses, and the summary statistics for our sample firms.

[3] See "SEC Reviewing Effects of ETFs on Volatility," *Wall Street Journal,* 19 October 2011.

A. Data

We obtain the data on ETF holdings from CRSP mutual fund files, which contain information about each individual ETF's equity holdings on the reporting dates. While holdings data are reported quarterly in most cases, the reporting dates do not always coincide with the end of calendar quarters. Thus, we assume that holdings on the reporting date remain the same between the reporting date and the latest of the following three dates: 1) the prior reporting date; 2) 365 days prior to the reporting date; or 3) the ETF inception date. We then take the snapshot of each individual ETF's holdings at the end of each calendar quarter as the ETF's holdings at that quarter. Our sample period begins at the last quarter of 2002 and ends at the third quarter of 2010.

We obtain information on firms' stock returns and financial data from CRSP (CRSP share code equal to 10 or 11) and Compustat, respectively. If a stock is not held by any ETF in a particular quarter, ETF holding is set at 0 for that quarter. We exclude stock-quarter observations with market capitalization less than $10 million or a stock price lower than $1. Our final sample consists of 138,622 stock-quarter observations.

B. Variable construction

Our key variable of interest is *ETF holding*. We measure firm value using Tobin's *q* and industry-adjusted Tobin's *q*; stock volatility using idiosyncratic volatility, systematic volatility, and total volatility; the extent of short selling using the short interest; and stock liquidity using stock turnover. These and the other variables used in the regression analyses are constructed as follows.

(1) *ETF holding*. The ETF holding of a stock is calculated as the proportion of shares outstanding held by all ETFs at the end of each calendar quarter. The logarithm of ETF holding is the natural logarithm of 1 plus ETF holding.

(2) *Tobin's q.* Tobin's *q* is the ratio of the market value of assets to the book value of assets at the end of the calendar quarter, where the market value of assets is the book value of assets minus the book

value of common equity plus the market value of common equity. To ensure that information on the fiscal quarter-end variables is available to the public at the end of the calendar quarter, we require the end of the fiscal quarter to be at least four months prior to the end of the calendar quarter.

(3) *Industry-adjusted Tobin's q*. Industry-adjusted Tobin's *q* is the difference between the firm's Tobin's *q* and the industry median Tobin's *q*, where the industry is measured at the 3-digit SIC level.

(4) *Idiosyncratic volatility*. For a given quarter, idiosyncratic volatility is the residual variance of the two-factor regression model $R_{it} = \alpha_i + \beta_i * M_t + \gamma_i * I_t + \varepsilon_{it}$, where R_{it} is the stock i's daily stock return at day t, M_t is the value-weighted CRSP market (excluding stock i) return at day t, and I_t is the value-weighted 3-digit SIC industry (excluding stock i) return.

(5) *Systematic volatility*. Systematic volatility is equal to [idiosyncratic volatility / $(1-R^2)$ – idiosyncratic volatility].

(6) *Total volatility*. Total volatility is the sum of idiosyncratic and systematic volatilities.

(7) *Stock turnover*. We define stock turnover as the quarterly average of the daily ratios of trading volume to total number of shares outstanding. The logarithm of stock turnover is the natural logarithm of stock turnover.

(8) *Short interest ratio*. The short interest ratio is the proportion of shares that are short sold at the end of the quarter. Data on short interest are obtained from the Compustat industrial files. The logarithm of the short interest ratio is the natural logarithm of 1 plus the short interest ratio.

(9) *Market value of equity*. The market value of equity is the price of the stock multiplied by the total number of shares outstanding at the end of each calendar quarter. The logarithm of the market value of equity is the natural logarithm of the market value of equity.

(10) *Return on assets (ROA)*. Return on assets is quarterly operating income scaled by the book value of assets at the end of the fiscal quarter.

(11) *Long-term leverage ratio*. Long-term leverage ratio is the ratio of long-term debt to the book value of assets.

(12) *R&D intensity*. R&D intensity is the ratio of R&D expenses to the book value of assets. If the value of R&D expenses is missing, it is set at 0.

The effects of ETF holdings on trading characteristics and firm value are likely to be nonlinear. For instance, a one percentage point increase in ETF holdings is likely to have stronger effects on firms that have no ETF holdings than on firms that already have 10% ETF holdings. For this reason, we use the logarithm of ETF holdings in all of our regression analyses. For the same reason, we use the logarithms of institutional ownership and short interest ratio to minimize nonlinear effects. We also use the logarithms of market value of equity and stock turnover as these variables are highly skewed.

C. Summary statistics

Table I presents the summary statistics for the full sample as well as the subsamples classified according to the size of ETF holdings. The first subsample includes firms with no ETF holdings. The second (third and fourth) subsample includes firms with ETF holdings in the low (middle and high) tercile, measured in each quarter.

Upon comparing firms in the low ETF holding tercile with those in the high ETF holding tercile, we find several noteworthy results. First, firms with high ETF holdings have both lower unadjusted Tobin's *q* (1.94 compared with 2.02) and lower industry-adjusted Tobin's *q* (0.44 compared with 0.49) than firms with low ETF holdings. These results support the negative view of ETFs. Second, compared to firms with low ETF holdings, firms with high ETF holdings have 1) lower idiosyncratic volatility (0.04 compared with 0.09) and higher systematic volatility (0.03 compared with 0.02), 2) higher stock turnover (1.15% compared with 0.65%), 3) higher short interest ratio (7.4% compared with 3.64%), and 4) higher market value of equity ($4.91 billion compared with $1.65 billion). Overall, these results suggest that firms with high ETF holdings are characterized by low value, low firm-specific risk, high systematic risk, high stock liquidity, a high proportion of shares that are sold short, and a large size.

Table II reports the Pearson correlations among the variables discussed above. ETF holding is highly correlated with systematic volatility (0.25), stock turnover (0.40), and short interest ratio (0.30). These

results are consistent with those in Table I and suggest that firms with high ETF holdings tend to be those with high systematic volatility, high stock liquidity, and high short interest. In addition, we find that short interest ratio is highly correlated with stock turnover (0.52), suggesting a positive link between liquidity and short-selling activities.

II. The valuation effect of ETFs on underlying stocks

In this section, we examine the ways in which ETF holdings affect firm value. Since the level of ETF holdings can capture some omitted unobservable stock characteristics (e.g., index membership) that also affect firm value, to minimize this endogenous concern, we use the change regressions. Specifically, we use the change in Tobin's *q* (industry-adjusted Tobin's *q*) from quarter *t-1* to quarter *t* as the dependent variable and regress it on the contemporaneous change in log (ETF holding) from quarter *t-1* to quarter *t* and our key variable of interest, the lagged change in log (ETF holding) from quarter *t-2* to quarter *t-1*.[4] We also include quarter dummies to control for time effects. This change regression should mitigate the endogeneity problem because the effects of any unobservable stock characteristics that do not change over the quarter are likely to be filtered out by using the change variables. Furthermore, since we use the lagged change in log (ETF holding) as our key variable of interest, which is a predetermined variable, regression results are less likely to be affected by the reversal causality bias.

Table III presents the results. Following Petersen (2005), we estimate *p*-values based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at stock and quarter levels.

Regressions 1 – 3 are estimated using unadjusted Tobin's *q* as the dependent variable. In regression 1, we use the full sample of firms. We find that the impact of the contemporaneous change in ETF holdings on the contemporaneous change in Tobin's *q* is not significant. However, the coefficient estimate on the

[4] For the sake of parsimony and consistency with the later tables that examine the effect of ETF holdings on firm characteristics, we do not control for other firm characteristics in the regressions. In Table X, however, we conduct the robustness test by including additional control variables that may affect Tobin's *q* in the regression. We find that the effect of ETF holdings on firm value remains the same in terms of both magnitude and statistical significance.

lagged change in log (ETF holding) from quarter *t-2* to quarter *t-1* is negative and significant, suggesting that increases in past ETF holdings lead to a decrease in future firm value.

The impact of ETF holdings on firm value is likely to be different between small and large firms as these two groups of firms are likely to be affected in different ways by stock characteristics that determine firm value. To examine this issue, we divide firms into two subgroups according to the sample median of market capitalization in each quarter and reestimate regression 1 separately for these two subgroups. The results are reported in regressions 2 and 3. We find that for small firms, the coefficient estimate on the contemporaneous change in log (ETF holding) is insignificant whereas the coefficient estimate on the lagged change in log (ETF holding) from quarter *t-2* to quarter *t-1* is negative and significant. However, for large firms, none of the coefficient estimates on the change in ETF holdings is significant. These results suggest that the negative effect of ETF holdings on firm value mainly exists for small firms.

In regressions 4 – 6, we reestimate regressions 1 – 3 using industry-adjusted Tobin's *q* as the dependent variable. The results are almost identical to those from regressions 1 – 3.

Our results in Table III, however, indicate that the change in ETF ownership, which is part of total institutional ownership, has a negative effect on firm value. To examine whether the impact of ETF ownership on firm value is distinct from that of other institutional ownership (total institutional ownership minus ETF ownership) on firm value, we include the changes in other institutional ownership as additional explanatory variables in Table III regressions.[5] The results are reported in Table IV.

In regressions 1 and 3, we replace log (ETF holding) in regressions 1 and 3 of Table III with log (other institutional ownership) in which other institutional ownership is computed as the proportion of shares held by other institutional investors at the end of the quarter. We find that in both regressions, the coefficient estimate on the contemporaneous change in log (other institutional ownership) is positive and significant at the 1% level, whereas the coefficient estimate on the lagged change in log (other institutional ownership) from quarter *t-2* to quarter *t-1* is insignificant. These results are consistent with

[5] Data on total institutional ownership are obtained from Thomson Reuter S34 files.

Gompers and Metrick (2001) who show that institutional ownership has a positive effect on firm value and argue that this positive effect is driven by institutional investors' demand shocks.

In regressions 2 and 4, we add the contemporaneous change in log (ETF holding) and the lagged change in log (ETF holding) from quarter *t-2* to quarter *t-1* as additional explanatory variables. The significance of coefficient estimates on the contemporaneous and lagged changes in log (other institutional ownership) remains unchanged: the coefficient estimate on the contemporaneous change in log (other institutional ownership) is significantly positive while that on the lagged change in log (other institutional ownership) is insignificant. However, we find that the coefficient estimate on the lagged change in log (ETF holding) is still negative and significant at the 1% level. These results indicate that our results in Table III are robust to controlling for other institutional ownership and ETF holdings indeed have a negative impact on underlying stock value.

III. Do ETFs affect underlying stocks' characteristics?

The previous section shows that an increase in ETF holdings has a negative causal effect on firm value. To identify the channels through which ETF holdings affect firm value, in this section we first examine how ETF holdings affect the characteristics of stocks that underlie ETFs, such as stock volatility, short interest, and stock liquidity, all of which are known to affect firm value. Specifically, we regress the change in these stock characteristics on the contemporaneous change in log (ETF holding), the lagged change in log (ETF holding) from quarter *t-2* to quarter *t-1*, the change in the market value of equity from quarter *t-1* to quarter *t*, and quarter fixed effects.[6] In the next section, we examine how the changes in stock characteristics caused by ETF holdings affect firm value.

A. Effects of ETF holdings on stock volatility

[6] In previous regression analyses (i.e., regressions in Tables III and IV), we do not include the change in the market value of equity as the control variable. Since the volatility of the book value of assets over the quarter is much smaller than that of the stock price over the same quarter, if we include the change in the market value of equity in the regression, any quarterly change in Tobin's *q* could be largely driven by such inclusion, thereby resulting in a strong mechanical link between the two variables.

In this subsection, we investigate whether the changes in ETF holdings cause changes in firm risk. We measure firm risk by total risk, idiosyncratic risk, and systematic risk. Table V presents the regression results. Regressions 1, 4, and 7 use the full sample and regressions 2, 5, and 8 and regressions 3, 6, and 9 use the subsamples of small and large firms, respectively.

In regressions 1 – 3, we use as the dependent variable the change in total volatility from quarter *t-1* to quarter *t*. We find no evidence that changes in ETF holdings lead to the change in total volatility.

In regressions 4 – 6, we use the change in idiosyncratic volatility from quarter *t-1* to quarter *t* as the dependent variable. Similar to the results in regressions 1 – 3, the coefficient estimates on the changes in log (ETF holding) are insignificant.

In regressions 7 – 9, we use the change in systematic volatility as the dependent variable. We find that the coefficient estimates on both contemporaneous and lagged change in log (ETF holding) are positive and significant for the full sample (regression 7). However, this positive effect of ETF holdings on systematic volatility exists only among small firms (regression 8). In a related paper, Ben-David, Franzoni, and Moussawi (2011) find a similar result to ours. They show that an increase in ETF ownership raises the stock daily volatility in the following month and such a positive effect mainly plays out among smaller stocks. They also show that an increase in the number of ETFs that own the stock increases stock volatility; the opposite happens if ETFs stop holding the stock. They argue that this high stock volatility is largely driven by the increase in exposure of the prices of underlying stocks to non-fundamental shocks coming from the ETF market, via arbitrage activity that takes place between ETFs and their underlying stocks.

In sum, the results in Table V show that ETF holdings affect firm risk only when the risk is measured by systematic volatility. The results also show that the positive relation between the change in ETF holdings and the change in systematic volatility is evident only for small firms. There appears to be no evidence of such a relation for large firms or when the risk is measured by total volatility or idiosyncratic volatility. To the extent that an ETF is similar to a stock index in that both are comprised of a basket of

underlying stocks, our results are consistent with Vijh (1994) and Barberis, Shleifer, and Wurgler (2005), who show that addition to the S&P 500 index leads to an increase in market beta.

B. Effects of ETF holdings on short interest

In this subsection, we examine the impact of ETF holdings on the short interest of ETF's underlying stocks. Table VI presents the results from regressions in which the dependent variable is the quarterly change in short interest ratio and the independent variables are those used in Table V regressions.

Regression 1 uses the full sample. We find that the coefficient estimates on both contemporaneous and lagged changes in ETF holding are positive and significant. Separating the full sample into two subgroups of small and large firms, we find that the positive relation between the change in short interest and the lagged change in ETF holdings is significant only for small firms (regression 2), while the positive relation between the change in short interest and the contemporaneous change in ETF holdings is significant for both small and large firms (regressions 2 and 3). We also find that the cumulative effect of the change in ETF holdings from quarter *t-2* to quarter *t* on the change in the short interest ratio from quarter *t-1* to quarter *t* is much larger for small firms than for large firms (0.013 compared to 0.005).[7]

In sum, the results in Table VI provide evidence that ETF holdings have a positive effect on short interest ratio and that this positive effect is more pronounced for small firms than for large firms.

C. Effects of ETF holdings on stock liquidity

In this subsection, we examine the effect of ETF holdings on the liquidity of its underlying stocks. We use as the dependent variable the change in stock turnover from quarter *t-1* to quarter *t*. The independent variables are the same as those used in Table V regressions. Table VII presents the regression results.

[7] The *F*-test of the null hypothesis that the cumulative effect of the change in ETF holdings is the same between small and large firms is rejected at the 10% level.

In regression 1, the coefficient estimate on the change in ETF holdings from quarter *t-2* to quarter *t-1* is 0.042, significant at the 10% level. In regressions 2 and 3, we find that this positive and significant relation between the change in stock turnover and the change in ETF holdings for the full sample comes mainly from the subsample of small firms. Thus, an increase in ETF holdings results in an increase in stock turnover only for small firms.

IV. Do ETF-related changes in stock characteristics affect firm value?

In the previous sections, we demonstrate that ETF holdings have a negative effect on firm value. We also find that ETF holdings positively affect systematic risk, short interest ratio, and stock liquidity. In this section we investigate how these changes in stock characteristics caused by the change in ETF holdings affect firm value. To this end, we conduct two-stage regression analyses. In the first stage, we decompose the changes in each of the three stock characteristics above into those that are associated with the changes in ETF holdings and those that are not. Specifically, we regress the change in a stock characteristic on the contemporaneous and lagged changes in ETF holdings. We term the predicted change in a stock characteristic due to the change in ETF holdings from this regression as "ETF-related change" and the residual as "non-ETF-related change". In the second stage, we regress the change in Tobin's *q* on the contemporaneous and lagged ETF-related changes in a stock characteristic as well as the contemporaneous and lagged non-ETF-related changes in a stock characteristic. We expect the effect of changes in ETF holdings on the change in firm value to come mainly from the ETF-related changes in a stock characteristic.

Table VIII presents the results from the second-stage regression. To account for the fact that ETF-related and non-ETF-related changes in stock characteristics are generated regressors, we adjust standard errors by using the correction method proposed by Murphy and Topel (1985). We also adjust standard errors by clustering at the stock and quarter levels. In regression 1, we regress the change in Tobin's *q* on ETF-related and non-ETF-related changes in systematic volatility. We find that only the coefficient estimate on the lagged ETF-related change in systematic volatility from quarter *t-2* to quarter *t-1* is

negative and significant, suggesting that the change in systematic volatility caused by the change in ETF holdings is an important channel through which ETFs affect firm value.

In regression 2, we regress the change in Tobin's *q* on ETF-related and non-ETF-related changes in short interest ratio. The estimation result shows that both the contemporaneous ETF-related and non-ETF-related changes in short interest ratio do not have any statistically significant effect on firm value. In contrast, both lagged ETF-related and non-ETF-related changes in short interest ratio from quarter *t-2* to quarter *t-1* have a negative and significant effect on firm value. Although the coefficient estimates on both lagged variables are statistically significant, the economic significance is much stronger for the lagged ETF-related change than for the lagged non-ETF-related change. The magnitude of the coefficient estimate on the former variable is about 22 times as large as that of the coefficient estimate on the latter variable (-13.716 compared to -0.617). The test of the difference in the sum of the coefficient estimates on the contemporaneous and lagged variables between ETF-related and non-ETF-related changes in short interest ratio strongly rejects the null hypothesis of equality (*p*-value = 0.03).

In regression 3, we examine the effects of ETF-related and non-ETF-related changes in stock liquidity (turnover) on firm value. The results are striking. Consistent with the previous literature that shows the negative relation between liquidity and expected returns, we find that both contemporaneous and lagged non-ETF-related changes in stock turnover are positively and significantly related to firm value. However, the lagged ETF-related increase in stock turnover from quarter *t-2* to quarter *t-1* negatively and significantly affects firm value. Thus, ETF-related and non-ETF-related changes in stock turnover have opposite effects on firm value, suggesting that liquidity improvement does not always have a positive effect on firm value. The null hypothesis of equal coefficient estimates between ETF-related and non-ETF-related changes in stock turnover is unequivocally rejected (*p*-value < 0.01).

Overall, the results in regression 3, together with those in Tables III and VI, suggest that the improvement in stock liquidity caused by ETFs can adversely affect firm value.

To better understand the underlying channel through which ETF-related changes in stock turnover adversely affect firm value, we examine how these changes are related to short-selling activities.

Specifically, we regress the change in log (short interest ratio) on the contemporaneous and lagged ETF-related and non-ETF-related changes in log (stock turnover). The results are reported in Table IX.

We find that the coefficient estimates on the contemporaneous and lagged changes in stock turnover are positive and significant, regardless of whether the change in stock turnover is ETF-related or not. However, the magnitude of the coefficient estimates on the contemporaneous (lagged) ETF-related change in stock turnover is much larger than that of the coefficient estimates on the contemporaneous (lagged) non-ETF related change in stock turnover, suggesting that the ETF-related increase in stock turnover is more strongly associated with short-selling activities than is the non-ETF related increase in stock turnover. The difference in the sum of the coefficient estimates on the contemporaneous and lagged variables between ETF-related and non-ETF-related changes in stock turnover is significant at the 1% level.

In sum, the results in Table VIII suggest that ETFs reduce firm value through their effects on systematic risk and short-sale activities. Moreover, the results in Tables VIII and IX indicate that the increases in stock liquidity, the seemingly desirable changes in stock characteristics, actually decrease firm value if these increases are driven by the change in ETF holdings, which affects investors' short-selling activities.

Given our findings that ETFs indeed have adverse effects on the value of their underlying stocks, an important issue that deserves further investigation is whether ETFs drive the value of underlying stocks close to or away from their fundamental value. For example, if ETF inclusion increases the supply of underlying firms' shares to sell short and thus relaxes short-sale constraints that were previously binding, then ETFs are likely to reduce the extent of their underlying stocks' overvaluation. However, if the negative valuation effect of ETFs on underlying stocks is driven by increased systematic volatility or the relatively high short-sale demand for underlying stocks, then ETFs could depress the value of underlying stocks relative to their fundamental value. While a clear understanding of this issue is important for both academic and practical purposes, it is beyond the scope of this paper and thus we leave its investigation for future research.

V. Overvaluation and Adverse Effect of ETFs on Firm Value

Thus far, we have shown that ETFs have a negative impact on the value of their underlying stocks, particularly small stocks. This result is consistent with the view that the rise of ETFs increases the supply of stocks for short sales, which leads to the decrease in stock prices. Since small firms are more likely subject to short sales constraints, this negative impact is expected to be particularly severe for small firms. In this section, we examine whether the negative impact of ETFs on the value of underlying firms is more pronounced when firms are overvalued, in which case the increases in the supply of stocks for short sales led by the change in ETF holdings is expected to have a more adverse effect on firm value.

Following Rhodes-Kropt, Robinson, and Viswanathan (2005), we decompose Tobin's *q* into two components, the ratio of the market value of assets to the intrinsic value of assets and the ratio of the intrinsic value of assets to the book value of assets, and examine which component of Tobin's *q* is negatively affected by ETF holdings. To the extent that stock overvaluation, if it exists, can be associated only with the market-to-intrinsic ratio, we expect ETF holdings to have a negative impact mainly on the market-to-intrinsic ratio.

The results are reported in Table X. In regressions (1)–(3), we examine the effect of the change in ETF holdings on the change in the market-to-intrinsic value, using the specifications similar to those in Table III. We find that the coefficient estimate on the lagged change in log (ETF holding) from quarter *t-2* to quarter *t-1* is negative and significant. Consistent with the results in Table III, the negative impact exists only for small firms. In regressions (4)–(6), we use contemporaneous change in the intrinsic-to-book ratio as the dependent variable. None of the coefficient estimates on the changes in log (ETF holding) are significant. Thus, the negative impact of ETF holdings on firm value exists only for the component of Tobin's *q* that is related to stock overvaluation.

Overall, the results in Table X suggest that the negative impact of ETF holdings on firm value mainly exists among small firms with high overvaluation. Since small firms are more likely subject to short sale constraints and the stock prices of firms with high overvaluation are more likely to drop in the

future, these results are consistent with the view that the reduction in short sale constraints for overvalued stocks largely drives such a negative impact.

Next, we examine how the decrease in firm value induced by ETF holdings affects firms' financial policy, namely stock repurchases. We focus on stock repurchases for two reasons. First, relative to other financing decisions, a firm can engage in stock repurchases in more flexible ways in terms of timing and repurchase amount. For example, the firm can choose repurchase timing and actual amount of repurchase at its discretion depending on its stock price and financial flexibility (Jagannathan, Stephens, and Weisbach (2000)). Second, previous studies show that equity value is one of important determinants of a firm's stock repurchase decisions and that the firm is more likely to buy back shares when the value of its equity is perceived to be low (see Stephens and Weisbach (1998)). Thus, if ETF holdings depress firm value, we expect that firms are more likely to buy back their shares subsequent to the increase in ETF holdings.

Table XI presents the results from the regression in which the dependent variable is the stock repurchase ratio (repurchase amount of common and preferred stocks during the quarter divided by total assets at the beginning of the quarter) and the explanatory variables are those used in the Table IV regressions. In regression (1), we use the full sample. We find that the impact of the contemporaneous change in ETF holdings on the magnitude of stock repurchases is significantly positive. However, the coefficient estimate on the lagged change in log (ETF holding) from quarter *t-2* to quarter *t-1* is insignificant.

Since the effect of ETF holdings on firm value exists mainly among small firms, if ETFs indeed make the prices of their underlying stocks deviate from the true value, the impact of ETFs on stock repurchase activities is likely to be particularly pronounced for small firms. To examine this issue, we divide firms into small and large firms according to the sample median of market capitalization in each quarter and reestimate regression (1) separately for these two subgroups. The results are reported in regressions (2) and (3), respectively. We find that for small firms, the coefficient estimates on both the contemporaneous change in log (ETF holding) and the lagged change in log (ETF holding) from quarter *t-*

2 to quarter *t-1* are positive and significant. However, for large firms, none of these coefficient estimates are significant. Thus, while large firms' stock repurchase decisions are not affected by the changes in ETF holdings, those of small firms significantly depend on these changes, suggesting that ETFs have an impact on the value of their underlying small stocks.

In regressions (4)–(6), we augment regressions (1)–(3) by including the contemporaneous change in log (other institutional ownership) and the lagged change in log (other institutional ownership) from quarter *t-2* to quarter *t-1* as additional explanatory variables. We find that the significance of coefficient estimates on both the contemporaneous change in log (ETF holding) and the lagged change in log (ETF holding) does not change. However, the corresponding coefficient estimates on other institutional ownership are significantly negative in all three regressions. Since Table IV shows that the change in other institutional ownership has a positive effect on firm value, these results are not surprising – firms are reluctant to buy back their shares when the value of their stock is relatively high – and further support the view that ETF and other institutional ownership have differential effects on firm value.

Taken as a whole, the results in this section provide compelling evidence that low firm value caused by ETF holdings provides small firms with strong incentives to repurchase their shares, suggesting ETF trading leads to depressed firm value.

VI. Robustness tests

To check the robustness of the results, we conduct several additional tests. Below, we summarize the results of these tests.

A. Valuation effect of ETFs: Controlling for additional firm characteristics

To show the robustness of results reported in Table III, in regressions 1 and 4 of Table III, we include changes in firm characteristic – change in operating performance (sales and ROA), change in capital structure (long-term leverage ratio), and change in investment activities (R&D intensity and

capital expenditure) – as additional control variables and reestimate these regressions. The results are presented in Table XII.

In regression 1, we use Tobin's *q* as the dependent variable. Similar to the results in Table III, the coefficient estimate on the change in log (ETF holding) from quarter *t-2* to quarter *t-1* is negative and significant at the 5% level.

In regression 2, we use industry-adjusted Tobin's *q* as the dependent variable. The coefficient estimate on the change in log (ETF holding) from quarter *t-2* to quarter *t-1* is again negative and significant.[8]

Overall, the results in Table XII indicate that the evidence on the negative effect of ETFs on firm value is robust to the control for additional firm characteristics.

B. Impact of ETF inception: Event study

As a further robustness test of the endogeneity concerns that unobservable firm characteristics affect both firm value and ETF holdings, we examine how underlying firm characteristics and firm value change around ETF inceptions. Since ETF inceptions are exogenous events that are not affected by firm characteristics or value, this test is expected to further mitigate the concern over potential endogeneity problems that could arise due to omitted unobservable firm characteristics. Specifically, for each ETF inception, we examine underlying firm characteristics and firm value at the end of quarters *t*, *t*+1, *t*+2, and *t*+3, where quarter *t* is the quarter before the ETF inception. The sample includes all U.S. common stocks held by the ETFs that have a non-missing value on the variables of interest for the four quarters.

Table XIII presents the results. The last column shows the *p*-values for the tests of differences in firm characteristics and stock value between *t* and *t*+3. The standard errors used for these tests are robust to the clustering within ETFs. Consistent with the results from previous regression analyses, we find that after ETF inceptions, stock turnover, short interest ratio, and stock repurchases significantly increase. However,

[8] In untabulated tests, we also estimate the regressions using level variables measured at the end of the current period and including firm fixed effects. We find that the coefficient estimates on ETF holdings remain significantly negative.

total risk, idiosyncratic risk, and systematic risk show little change around ETF inceptions. We also find a significant decrease in both Tobin's *q* and industry-adjusted Tobin's *q*. The magnitude of the decrease in Tobin's *q* is economically large and significant. The mean Tobin's *q* drops by 4.2% from quarter *t* to quarter *t+3*. The magnitude of the decrease in industry-adjusted Tobin's *q* is even more striking: it drops by 11.9% during the same period.

In untabulated tests, we use two alternative measures of firm value, market-to-book ratio and cumulative abnormal returns, and repeat the analysis above. To compute cumulative abnormal return, we use a four-factor model, Fama-French (1993) three factors plus momentum factor. Specifically, for a particular firm-month *t*, we use past 36 months of return data (*t*-37 to *t*-1) to estimate the four-factor model and then compute the abnormal return of month *t* as the difference between the realized return and the estimated return from the four-factor model. For each quarter around the ETF inception quarters, we sum the monthly abnormal returns to compute the quarterly cumulative abnormal return in that quarter. We find that the results are identical to those in Table XIII: both market-to-book ratio and cumulative abnormal returns decrease significantly from quarter *t* to quarter *t+3*.

Overall, these results are consistent with those in previous tables and suggest that ETF holdings are associated with the decrease in firm value, possibly because of the increase in short-selling activities subsequent to the ETF inceptions.

However, it is also possible that the negative effect of ETF holdings on underlying firms' value is attributable to investors' trading with the anticipation that ETF inception increases the demand for the underlying firms' shares. For example, investors who anticipate ETF inception may accumulate underlying firms' shares prior to inception and sell the shares after that. If this is the case, we should observe, respectively, increasing and decreasing trends in firm value and short interest ratio before the ETF inception date. However, as shown in Figures 3 and 4, we do not find such trends around the ETF inception date. In Figure 3, which shows the changes in Tobin's *q* and industry-adjusted Tobin's *q* over quarter *t*-3 to quarter *t*+3 (quarter *t* is the quarter before the ETF inception), we find no evidence that firm value increases before ETF inception. In Figure 4, which shows the changes in short interest ratio over

quarter *t*-3 to quarter *t*+3, we find little evidence that short interest ratio decreases before ETF inception. Similarly, if the demand for underlying stocks increases before ETF inceptions, we should observe a decrease in stock repurchase before the inception quarter. However, as shown in Figure 5, we do not observe such a decrease in the magnitude of actual stock repurchases before the inception quarter. These patterns of the changes in firm value, short interest ratio, and stock repurchase activities before ETF inception cast doubt on the claim that investors anticipating ETF inception increase the holdings in ETF's underlying stocks prior to inception, thereby increasing firm value.

VII. Summary and conclusion

We observe a secular upward trend in ETF trading over the past two decades. The rise of ETFs has had a substantial impact on investors' trading environments, the liquidity of underlying stocks, and the capital market as a whole. However, we know little about how ETFs affect the welfare of one of the most important stakeholders in ETFs — the issuers of the underlying stocks. In this paper, we seek to address this gap in the literature by investigating whether and how ETFs affect the value of the underlying stocks.

We find that ETFs have a negative and significant impact on the value of the underlying stocks, especially for small firms. We also find that the increases in systematic risk, short-selling activities, and liquidity induced by the increases in ETF holdings are the main channels through which ETFs adversely affect the value of small stocks. While ETFs improve the stock liquidity of small stocks, the increases in stock liquidity caused by the changes in ETF holdings are largely related to the increase in short-selling activities, which causes the decline in firm value.

These findings suggest that investors do not always benefit from the introduction and rise of ETFs. Our results suggest that the success of ETFs as a new trading vehicle is not without cost and support the view that allowing ETFs to invest in small firms and the price comovement caused by ETFs without a comovement in fundamentals can have an adverse effect on firm value. Given the increasing evidence of

the effects of stock prices on corporate policies,[9] our finding on the negative valuation effect of ETFs suggests that the growth of ETFs can potentially influence the financial and investment policies of their underlying firms. Examining such policy impacts would be a useful area for future research.

[9] For studies of the effects of stock prices on corporate policies, see, for example, Chirinko and Schaller (2001), Goyal and Yamada (2004), Campello and Graham (2007), Chen, Goldstein, and Jiang (2007), Polk and Sapienza (2009), Edmans, Goldstein, and Jiang (2011), Campello, Ribas, and Wang (2010), and Grullon, Michenaud, and Weston (2011).

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Appendix
Variable descriptions

This appendix provides a detailed description of the construction of variables used in the tables.

Variables	Description
	ETF holding measure:
ETF holding	Proportion of shares outstanding held by all ETFs at the end of each calendar quarter. The logarithm of ETF holding is the natural logarithm of one plus ETF holding.
	Stock characteristic measures:
Idiosyncratic volatility	Residual variance of the two-factor regression model $R_{it} = \alpha_i + \beta_i * M_t + \gamma_i * I_t + \varepsilon_{it}$, where R_{it} is the stock i's daily stock return at day t, M_t is the value-weighted CRSP market (excluding stock i) return at day t, and I_t is the value-weighted 3-digit SIC industry (excluding stock i) return.
Systematic volatility	[Idiosyncratic volatility / $(1-R^2)$] – idiosyncratic volatility.
Total volatility	Sum of the idiosyncratic and systematic volatilities.
Stock turnover	Quarterly average of daily ratios of trading volume to total number of shares outstanding. The logarithm of stock turnover is the natural logarithm of stock turnover.
Short interest ratio	Proportion of shares that are short sold at the end of the quarter. Data on short interest are from the Compustat industrial files. The logarithm of short interest ratio is the natural logarithm of one plus short interest ratio.
Market value of equity	Price of the stock times total number of shares outstanding at the end of each calendar quarter. The logarithm of the market value of equity is the natural logarithm of the market value of equity.
Stock repurchases	Quarterly purchase of common and preferred stocks scaled by total assets at the beginning of the quarter.
Other institutional ownership	Proportion of shares held by institutional investors minus ETF ownership at the end of the quarter. Logarithm of other institutional ownership is the natural logarithm of one plus other institutional ownership. Data on institutional ownership are from Thomson Reuter S34 files.
Sales	Net sales.
Return on assets (ROA)	Quarterly operating income scaled by the book value of assets at the end of the fiscal quarter.
Long-term leverage ratio	Ratio of long-term debt to the book value of assets.
R&D intensity	Ratio of R&D expenses to the book value of assets. If the value of R&D expenses is missing, it is then set at 0.
Capital expenditure	Capital expenditure scaled by total assets.

	Valuation measures:
Tobin's q	Ratio of the market value of assets to the book value of assets at the end of the calendar quarter, where the market value of assets is the book value of assets minus the book value of common equity plus the market value of common equity. To ensure that information on the fiscal quarter-end variables is available to the public at the end of the calendar quarter, we require the end of the fiscal quarter to be at least four months prior to the end of the calendar quarter. The variable is winsorized at 1% and 99% of its empirical distributions.
Industry-adjusted Tobin's q	Difference between the firm's Tobin's q and the industry median Tobin's q, where the industry is measured at the 3-digit SIC level.

Table I
Summary Statistics

This table presents the mean values of the variables used in the paper. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. The appendix provides a detailed description of the construction of all of the variables used in the table. The second column presents the mean values for the full sample. In the next four columns, firms are divided into four groups according to the level of ETF holdings. The first group includes all stock quarters with zero ETF holdings. The second (third, fourth) group includes all stock quarters with ETF holdings in the low (middle, high) tercile for that quarter.

Variables	Full sample	Subsample of firms classified according to the level of ETF holdings				Test of difference
		Zero	Low	Middle	High	*p*-value (high – low)
Sample size	138,662	48,478	30,050	30,073	30,061	
ETF holding (%)	1.558	0.000	0.670	2.206	4.313	(0.00)
Tobin's *q*	1.969	1.915	2.017	2.035	1.939	(0.00)
Industry-adjusted Tobin's *q*	0.440	0.362	0.493	0.515	0.437	(0.00)
Total volatility	0.089	0.102	0.102	0.079	0.066	(0.00)
Idiosyncratic volatility	0.072	0.095	0.085	0.052	0.040	(0.00)
Systematic volatility	0.018	0.007	0.017	0.027	0.026	(0.00)
Stock turnover (%)	0.773	0.479	0.653	0.979	1.153	(0.00)
Short interest ratio (%)	4.332	2.145	3.642	5.192	7.404	(0.00)
Stock repurchase (%)	0.503	0.279	0.416	0.712	0.733	(0.00)
Market value of equity (in billions of dollars)	3.098	0.440	1.646	7.021	4.912	(0.00)

Table II
Correlations among ETF Holdings, Firm Value, and Stock Characteristics

This table presents Pearson correlations among ETF holdings, firm value, and stock characteristics. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. The appendix provides a detailed description of the construction of all of the variables used in the table.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Log (ETF holding)	1.000							
(2) Tobin's *q*	-0.043							
(3) Industry-adjusted Tobin's *q*	-0.002	0.950						
(4) Total volatility	0.006	0.007	0.010					
(5) Idiosyncratic volatility	-0.006	0.009	0.011	0.999				
(6) Systematic volatility	0.245	-0.044	-0.003	0.620	0.586			
(7) Log (stock turnover)	0.398	0.233	0.189	0.015	0.006	0.179		
(8) Log (short interest ratio)	0.300	0.153	0.144	-0.000	-0.005	0.096	0.519	
(9) Log (market value of equity)	0.325	0.121	0.120	-0.045	-0.048	0.035	0.480	0.232

Table III
Effects of ETF Holdings on Firm Value

This table presents the results from regressions of the change in firm value on the changes in ETF holdings. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. In regressions (1) through (3), the dependent variable is the change in Tobin's *q* and in regressions (4) through (6), the dependent variable is the change in industry-adjusted Tobin's *q*. Firms are divided into small and large firms according to the sample median of the market value of equity in each quarter. In all regressions, calendar quarter dummies are included. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Change in Tobin's *q*			Change in industry-adjusted Tobin's *q*		
	(1) Full sample	(2) Small firms	(3) Large firms	(4) Full sample	(5) Small firms	(6) Large firms
Change in log (ETF holding)$_{t-1,t}$	-0.001	-0.024	0.010	-0.003	-0.021	-0.000
	(0.97)	(0.45)	(0.63)	(0.86)	(0.52)	(0.99)
Change in log (ETF holding)$_{t-2,\ t-1}$	-0.031***	-0.097***	0.005	-0.050***	-0.107***	-0.022
	(0.01)	(0.00)	(0.76)	(0.00)	(0.00)	(0.24)
Constant	0.256***	0.245***	0.265***	0.070***	0.065***	0.075***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Quarter dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	121,143	60,579	60,564	103,665	51,840	51,825
Adjusted *R*-squared	0.04	0.04	0.05	0.00	0.01	0.01

Table IV
Effects of Other (Non-ETF) Institutional Ownership on Firm Value

This table presents the results from regressions of the change in firm value on the changes in other (non-ETF) institutional ownership and the changes in ETF holdings. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. In regressions (1) and (2), the dependent variable is the change in Tobin's *q* and in regressions (3) and (4), the dependent variable is the change in industry-adjusted Tobin's *q*. In all regressions, calendar quarter dummies are included. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Change in Tobin's *q*		Change in Industry-adjusted Tobin's *q*	
	(1)	(2)	(3)	(4)
Change in log (other institutional ownership)$_{t-1,t}$	1.740***	1.749***	1.714***	1.724***
	(0.00)	(0.00)	(0.00)	(0.00)
Change in log (other institutional ownership)$_{t-2,\ t-1}$	-0.023	-0.033	-0.007	-0.018
	(0.89)	(0.84)	(0.97)	(0.91)
Change in log (ETF holding)$_{t-1,t}$		0.019		-0.016
		(0.19)		(0.36)
Change in log (ETF holding)$_{t-2,\ t-1}$		-0.048***		-0.069***
		(0.00)		(0.00)
Constant	0.249***	0.248***	0.063***	0.063***
	(0.00)	(0.00)	(0.00)	(0.00)
Quarter dummies	Yes	Yes	Yes	Yes
Number of observations	109,310	109,310	93,965	93,965
Adjusted *R*-squared	0.05	0.05	0.01	0.01

Table V
Effects of ETF Holdings on Stock Volatility

This table presents the results from regressions of the change in stock risk profiles on the changes in ETF holdings and the change in the market value of equity. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. In regressions (1) through (3), the dependent variable is the change in total volatility, in regressions (4) through (6), the dependent variable is the change in idiosyncratic volatility, and in regressions (7) through (9), the dependent variable is the change in systematic volatility. Firms are divided into small and large firms according to the sample median of the market value of equity in each quarter. In all regressions, calendar quarter dummies are included. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Change in total volatility			Change in idiosyncratic volatility			Change in systematic volatility		
	(1) Full sample	(2) Small firms	(3) Large firms	(4) Full sample	(5) Small firms	(6) Large firms	(7) Full sample	(8) Small firms	(9) Large firms
Change in log (ETF holding)$_{t-1,t}$	-0.006	-0.007	-0.003	-0.009	-0.013	-0.002	0.003*	0.006*	-0.001
	(0.41)	(0.66)	(0.20)	(0.21)	(0.38)	(0.13)	(0.08)	(0.09)	(0.65)
Change in log (ETF holding)$_{t-2,\ t-1}$	0.002	0.009	0.004	-0.004	-0.005	0.002	0.007**	0.014*	0.002
	(0.37)	(0.40)	(0.26)	(0.22)	(0.45)	(0.43)	(0.05)	(0.07)	(0.19)
Change in log (market value of equity)$_{t-1,t}$	-0.009	0.011	-0.035*	0.004	0.018	-0.010	-0.013*	-0.007	-0.025**
	(0.73)	(0.66)	(0.10)	(0.83)	(0.38)	(0.37)	(0.07)	(0.25)	(0.02)
Constant	0.001	0.003	0.000	0.001	0.003	-0.000	-0.000	0.000	0.001
	(0.87)	(0.59)	(0.95)	(0.74)	(0.52)	(0.87)	(0.75)	(0.92)	(0.76)
Quarter dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	118,750	59,374	59,376	118,750	59,374	59,376	118,750	59,374	59,376
Adjusted *R*-squared	0.06	0.05	0.15	0.02	0.03	0.03	0.27	0.19	0.38

Table VI
Effects of ETF Holdings on Short Interest

This table presents the results from regressions of the change in the short interest ratio on the changes in ETF holdings and the change in the market value of equity. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. Firms are divided into small and large firms according to the sample median of the market value of equity in each quarter. In all regressions, calendar quarter dummies are included. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Change in log (short interest ratio)		
	(1) Full sample	(2) Small firms	(3) Large firms
Change in log (ETF holding)$_{t-1,t}$	0.003***	0.003*	0.003**
	(0.00)	(0.10)	(0.02)
Change in log (ETF holding)$_{t-2,\ t-1}$	0.005**	0.010*	0.002
	(0.05)	(0.06)	(0.20)
Change in log (market value of equity)$_{t-1,t}$	-0.000	0.002*	-0.006***
	(0.75)	(0.06)	(0.00)
Constant	-0.000	0.000	0.000
	(0.83)	(0.33)	(0.80)
Quarter dummies	Yes	Yes	Yes
Number of observations	105,620	52,808	52,812
Adjusted *R*-squared	0.05	0.06	0.06

Table VII
Effects of ETF Holdings on Stock Liquidity

This table presents the results from regressions of the change in stock liquidity on the changes in ETF holdings and the change in the market value of equity. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. The dependent variable is the change in the logarithm of stock turnover. Firms are divided into small and large firms according to the sample median of the market value of equity in each quarter. In all regressions, calendar quarter dummies are included. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Change in log (stock turnover)		
	(1) Full sample	(2) Small firms	(3) Large firms
Change in log (ETF holding)$_{t-1,t}$	0.029	0.052	-0.007
	(0.45)	(0.44)	(0.47)
Change in log (ETF holding)$_{t-2,\ t-1}$	0.042*	0.083**	0.007
	(0.10)	(0.04)	(0.67)
Change in log (market value of equity)$_{t-1,t}$	0.298***	0.482***	-0.031
	(0.00)	(0.00)	(0.28)
Constant	0.205***	0.322***	0.117***
	(0.00)	(0.00)	(0.00)
Quarter dummies	Yes	Yes	Yes
Number of observations	123,352	61,685	61,667
Adjusted *R*-squared	0.07	0.10	0.10

Table VIII
Effects of ETF-Related Changes in Stock Characteristics on Firm Value

This table presents the results from regressions of the change in Tobin's *q* on the changes in stock characteristics. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. The change in the stock characteristics is decomposed into two components according to whether it is related to the change in ETF holdings. Specifically, the change in the stock characteristics from quarter *t-1* to quarter *t* is regressed on the contemporaneous change in the logarithm of ETF holdings from quarter *t-1* to quarter *t* and the lagged change in the logarithm of ETF holdings from quarter *t-2* to quarter *t-1*. The ETF-related and non-ETF-related changes in stock characteristics are the predicted value and the residual from this regression, respectively. In regressions 1 – 3, the stock characteristics of interest are systematic volatility, the logarithm of the short interest ratio, and the logarithm of stock turnover, respectively. In all regressions, calendar quarter dummies are included. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. To account for the fact that ETF-related and non-ETF-related changes in stock characteristics are generated regressors, standard errors are adjusted by using the correction method proposed by Murphy and Topel (1985). The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Dependent variable: change in Tobin's *q*		
	Independent variables are ETF-related and non-ETF-related changes in:		
	(1) Systematic volatility	(2) Log (short interest ratio)	(3) Log (stock turnover)
ETF-related change in stock characteristics $_{t-1,t}$: (a)	-0.738 (0.61)	-3.966 (0.36)	0.130 (0.62)
ETF-related change in stock characteristics $_{t-2,t-1}$: (b)	-4.266*** (0.02)	-13.716** (0.04)	-0.594*** (0.01)
Non-ETF-related change in stock characteristics $_{t-1,t}$: (c)	-0.288 (0.15)	-0.388 (0.19)	0.156*** (0.00)
Non-ETF-related change in stock characteristics $_{t-2,t-1}$: (d)	-0.117 (0.34)	-0.617*** (0.00)	0.083*** (0.00)
Constant	0.1450*** (0.00)	-0.041*** (0.00)	0.138*** (0.00)
Quarter dummies	Yes	Yes	Yes
Number of observations	111,276	99,017	115,764
Adjusted *R*-squared	0.04	0.04	0.05
Test of difference in coefficient estimates between ETF-related and non-ETF-related changes in stock characteristics (*p*-value): (a + b) = (c + d)	(0.00)	(0.03)	(0.00)

Table IX
Effects of ETF-Related Changes in Stock Turnover on Changes in the Short Interest Ratio

This table presents the results from regressions of the change in the logarithm of the short interest ratio on the change in the logarithm of stock turnover and the change in the market value of equity. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in CRSP stock files during the period from December 31, 2002 to September 30, 2010. The change in the logarithm of the stock turnover ratio is decomposed into two components according to whether this change is related to the change in ETF holdings. Specifically, the change in the logarithm of stock turnover from quarter *t-1* to quarter *t* is regressed on the contemporaneous change in the logarithm of ETF holdings from quarter *t-1* to quarter *t* and the change in the logarithm of ETF holdings from quarter *t-2* to quarter *t-1*. The ETF-related and non-ETF-related changes in stock turnover are the predicted value and the residual from this regression, respectively. The regression includes calendar quarter dummies. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. To account for the fact that ETF-related and non-ETF-related changes in stock characteristics are generated regressors, standard errors are adjusted by using the correction method proposed by Murphy and Topel (1985). The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Change in log (short interest ratio)
ETF-related change in log (stock turnover)$_{t-1,t}$: (a)	0.045***
	(0.00)
ETF-related change in log (stock turnover)$_{t-2,t-1}$: (b)	0.033**
	(0.03)
Non-ETF-related change in log (stock turnover)$_{t-1,t}$: (c)	0.007***
	(0.00)
Non-ETF-related change in log (stock turnover)$_{t-2,t-1}$: (d)	0.004***
	(0.00)
Change in log (market value of equity)$_{t-1,t}$	-0.002*
	(0.06)
Constant	-0.005***
	(0.00)
Quarter dummies	Yes
Number of observations	101,766
Adjusted *R*-squared	0.07
Test of difference in coefficient estimates between ETF-related and non-ETF-related changes in log (stock turnover)(*p*-value): (a + b) = (c + d)	(0.01)

Table X
Effects of ETF Holdings on Firm Value: Decomposition of Tobin's *q* into Two Components

This table presents the results from regressions of the change in firm value on the changes in ETF holdings. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. Following Rhodes-Kropf, Robinson, and Viswanathan (2005), we decompose Tobin's *q* into two components: the ratio of the market value of assets to the intrinsic value of assets and the ratio of intrinsic value of assets to the book value of assets. In regressions (1)–(3), the dependent variable is the change in the ratio of the market value of assets to the intrinsic value of assets and in regressions (4)–(6), the dependent variable is the change in the ratio of intrinsic value of assets to the book value of assets. Firms are divided into small and large firms according to the sample median of the market value of equity in each quarter. In all regressions, calendar quarter dummies are included. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Dependent variable:					
	Change in log (market value of assets / intrinsic value of assets)$_{t-1,t}$			Change in log (intrinsic value of assets / book value of assets)$_{t-1,t}$		
	(1) Full sample	(2) Small firms	(3) Large firms	(4) Full sample	(5) Small firms	(6) Large firms
Change in log (ETF holding)$_{t-1,t}$	0.002	-0.005	0.001	-0.004	-0.012	0.003
	(0.76)	(0.67)	(0.91)	(0.76)	(0.45)	(0.83)
Change in log (ETF holding)$_{t-2,t-1}$	-0.015**	-0.044***	-0.003	-0.003	-0.008	0.004
	(0.02)	(0.00)	(0.75)	(0.76)	(0.52)	(0.68)
Constant	0.015***	-0.028***	0.059***	0.205***	0.277***	0.131***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Quarter dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	110,914	55,720	55,194	110,914	55,720	55,194
Adjusted *R*-squared	0.00	0.00	0.01	0.08	0.08	0.09

Table XI
Effects of ETF Holdings on Stock Repurchases

This table presents the results from regressions of the magnitude of firms' quarterly stock repurchases on the changes in ETF holdings and the changes in other institutional ownership. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. Firms are divided into small and large firms according to the sample median of the market value of equity in each quarter. In all regressions, calendar quarter dummies are included. However, for the sake of brevity, the coefficient estimates on these dummies are not reported. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

	Dependent variable: quarterly stock repurchases					
Variables	(1) Full sample	(2) Small firms	(3) Large firms	(4) Full sample	(5) Small firms	(6) Large firms
Change in log (ETF holding)$_{t-1,t}$	0.002**	0.002***	-0.000	0.002*	0.002***	-0.000
	(0.03)	(0.00)	(0.93)	(0.07)	(0.00)	(0.74)
Change in log (ETF holding)$_{t-2,\ t-1}$	0.002	0.001***	-0.001	0.002	0.001***	-0.001
	(0.18)	(0.00)	(0.43)	(0.22)	(0.00)	(0.53)
Change in log (other institutional ownership)$_{t-1,t}$				-0.013***	-0.007***	-0.026***
				(0.00)	(0.00)	(0.00)
Change in log (other institutional ownership)$_{t-2,\ t-1}$				-0.011***	-0.002**	-0.026***
				(0.00)	(0.03)	(0.00)
Constant	0.003***	0.002***	0.004***	0.003***	0.002***	0.005***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Quarter dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	104,102	52,051	52,051	93,862	50,317	43,545
Adjusted *R*-squared	0.01	0.01	0.02	0.01	0.01	0.03

Table XII
Robustness Tests: Valuation Effect of ETFs

This table presents the results from regressions of the change in firm value on the change in ETF holdings and other control variables. The sample includes all U.S. common stocks (share code equal to 10 or 11) covered in the CRSP stock files during the period from December 31, 2002 to September 30, 2010. In regression (1), the dependent variable is Tobin's *q* and in regression (2), the dependent variable is industry-adjusted Tobin's *q*. The appendix provides a detailed description of the construction of all of the variables used in the table. The *p*-values in parentheses are based on standard errors that are heteroskedasticity consistent and allow for two-way clustering at the stock and quarter levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Tobin's *q* (1)	Industry-adjusted Tobin's *q* (2)
Change in log (ETF holding)$_{t-1,t}$	-0.005 (0.73)	-0.007 (0.71)
Change in log (ETF holding)$_{t-2,\ t-1}$	-0.025** (0.02)	-0.041*** (0.00)
Change in log (sales)$_{t-1,t}$	-0.117*** (0.00)	-0.112*** (0.00)
Change in ROA$_{t-1,t}$	-1.093*** (0.00)	-1.144*** (0.00)
Change in long-term leverage ratio$_{t-1,t}$	-0.032 (0.72)	0.023 (0.81)
Change in R&D intensity$_{t-1,t}$	7.395*** (0.00)	7.984*** (0.00)
Change in capital expenditure$_{-1,t}$	0.461** (0.02)	0.398*** (0.01)
Constant	-0.042*** (0.00)	0.015*** (0.00)
Quarter dummies	Yes	Yes
Number of observations	113,257	96,251
Adjusted *R*-squared	0.07	0.04

Table XIII
Changes in Stock Characteristics and Firm Value around ETF Inceptions

This table shows mean and median (in bracket) in stock characteristics and firm value around ETF inception quarters. The sample includes all U.S. common stocks (CRSP share code equal to 10 or 11) held by ETFs that meet the following criteria: 1) the ETFs are covered in the CRSP mutual fund file; 2) the ETF inception dates are between December 31, 2002 and September 30, 2010; and 3) underlying stocks have non-missing values for their characteristics from quarter *t* to quarter *t+3* where quarter *t* is the quarter immediately before the ETF inception. The changes in stock characteristics/firm value are the mean and median (in brackets) differences in stock characteristics/firm value between quarter *t* and quarter *t*+3. The appendix provides a detailed description of the construction of all of the variables used in the table. The last column reports the *p*-value for the test that the difference in mean stock characteristics/firm value between quarter *t* and quarter *t*+3 is zero. Standard errors allow for clustering at the ETF levels. The symbols ***, **, and * denote significance at the 1, 5, and 10% levels, respectively.

Variables	Calendar quarters relative to ETF inception (*t*)					
	t	*t+1*	*t+2*	*t+3*	Change from *t* to *t+3*	*p*-value
Total volatility	0.055 [0.028]	0.054 [0.026]	0.050 [0.026]	0.062 [0.032]	0.007 [0.004]	(0.59)
Idiosyncratic volatility	0.034 [0.017]	0.033 [0.015]	0.031 [0.015]	0.038 [0.017]	0.003 [0.000]	(0.67)
Systematic volatility	0.021 [0.008]	0.021 [0.008]	0.019 [0.008]	0.024 [0.012]	0.004 [0.004]	(0.51)
Log (stock turnover)	-0.204 [-0.174]	-0.162 [-0.138]	-0.115 [-0.090]	-0.088 [-0.055]	0.116 [0.119]	(0.00)***
Log (short interest ratio)	0.054 [0.038]	0.057 [0.041]	0.061 [0.045]	0.060 [0.043]	0.006 [0.005]	(0.00)***
Tobin's *q*	2.010 [1.535]	2.000 [1.526]	1.962 [1.516]	1.926 [1.484]	-0.084 [-0.051]	(0.02)**
Industry-adjusted Tobin's *q*	0.479 [0.084]	0.473 [0.081]	0.438 [0.074]	0.423 [0.066]	-0.057 [-0.018]	(0.00)***
Stock repurchase (%)	0.740 [0.000]	0.758 [0.000]	0.806 [0.000]	0.873 [0.000]	0.133 [0.000]	(0.02)**

Figure 1. Total Net Assets Held by ETFs

This figure shows the aggregate total net assets in billions of dollars held by ETFs. The sample includes ETFs covered in the CRSP mutual fund file during the period from December 31, 2002 to September 30, 2010.

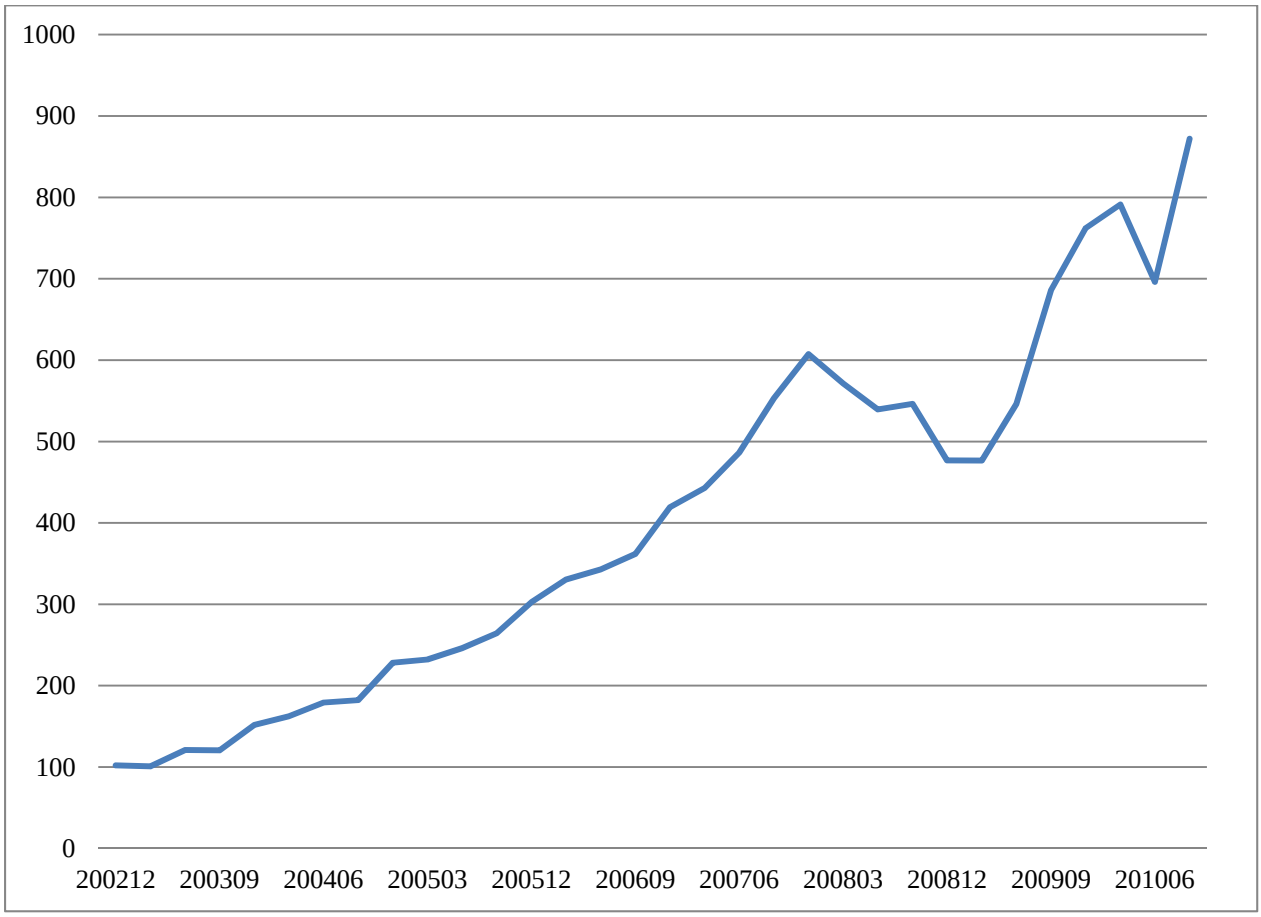

Figure 2. ETF Trading Percentage at the Aggregate Level

This figure shows the percentage of the aggregate ETF dollar volume to the aggregate dollar volume of all stock trading. The sample includes all stocks covered in the CRSP stock files and all ETFs covered in the CRSP mutual fund file during the period from December 31, 2002 to September 30, 2010. The scale on the left-hand side indicates the percentage and the scale on the right-hand side indicates the number of ETFs in the sample.

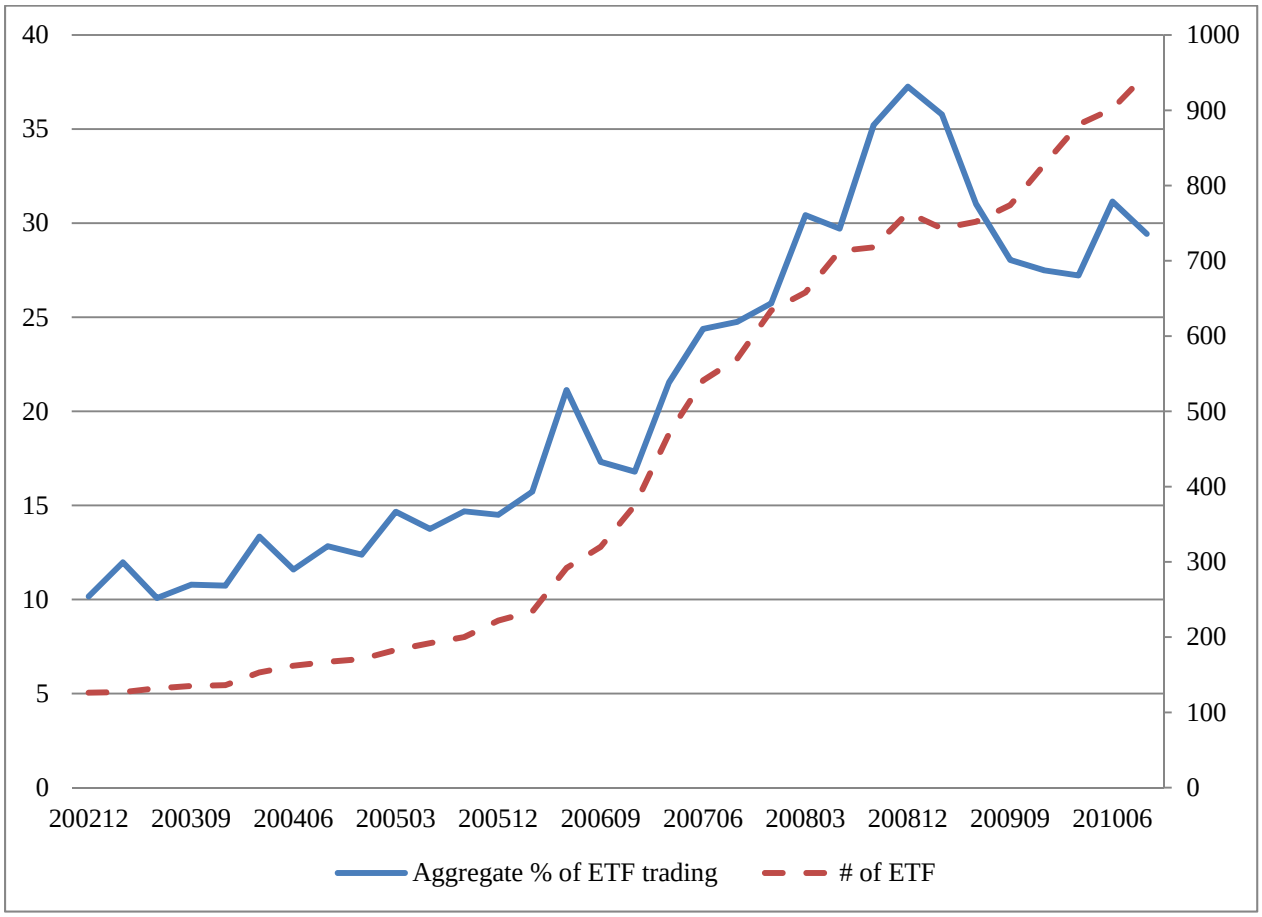

Figure 3. Changes in Firm Value around ETF Inceptions

This figure shows the average Tobin's *q* and industry-adjusted Tobin's *q* for ETF's underlying stocks over the seven-quarter period around ETF inceptions. Quarter *t* is the quarter before ETF inception. The sample includes all ETF firms covered in the CRSP mutual fund file during the period from December 31, 2002 to September 30, 2010. Left-hand scale and right-hand scale represent Tobin's *q* and industry-adjusted Tobin's *q*, respectively.

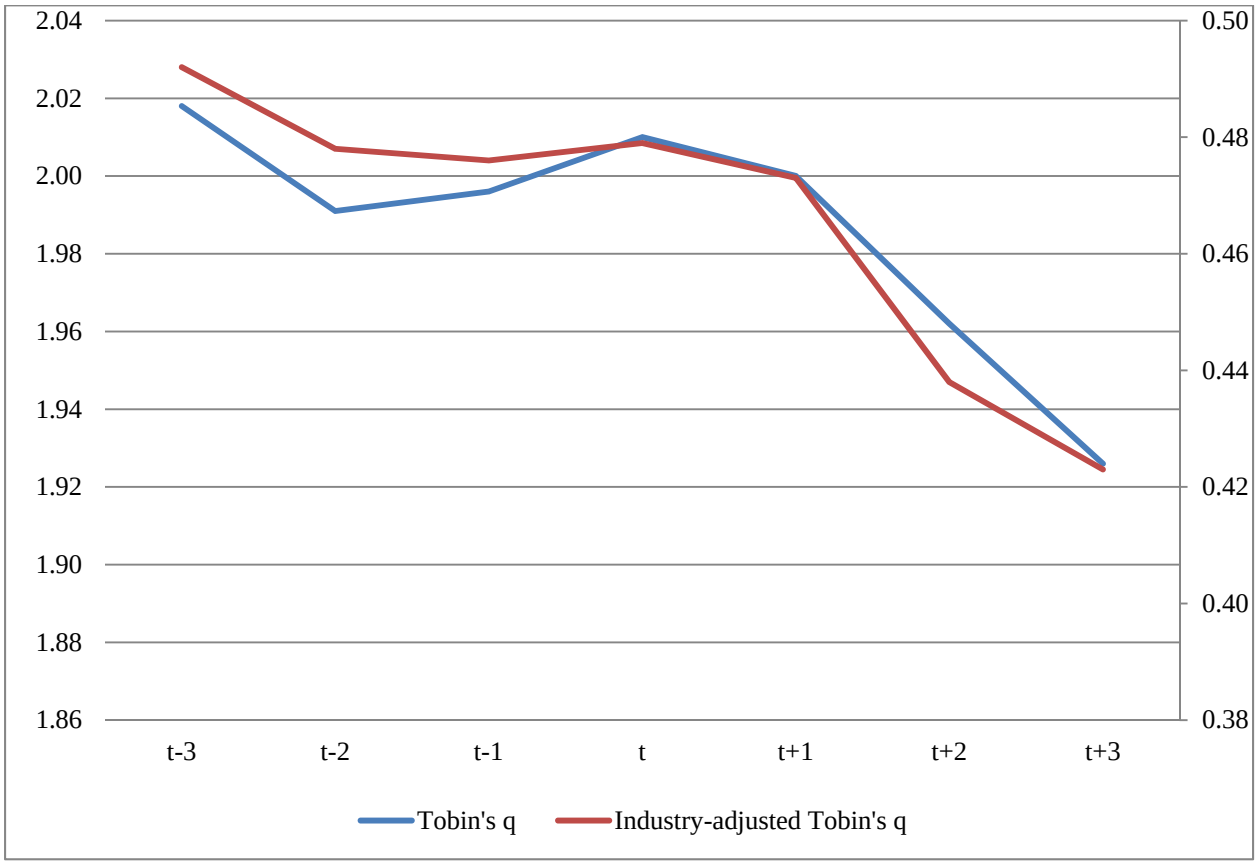

Figure 4. Changes in the Short Interest Ratio around ETF Inceptions

This figure shows the average short interest ratio during the seven-quarter period around ETF inceptions. Quarter *t* is the quarter before ETF inception. The sample includes all ETF firms covered in the CRSP mutual fund file during the period from December 31, 2002 to September 30, 2010.

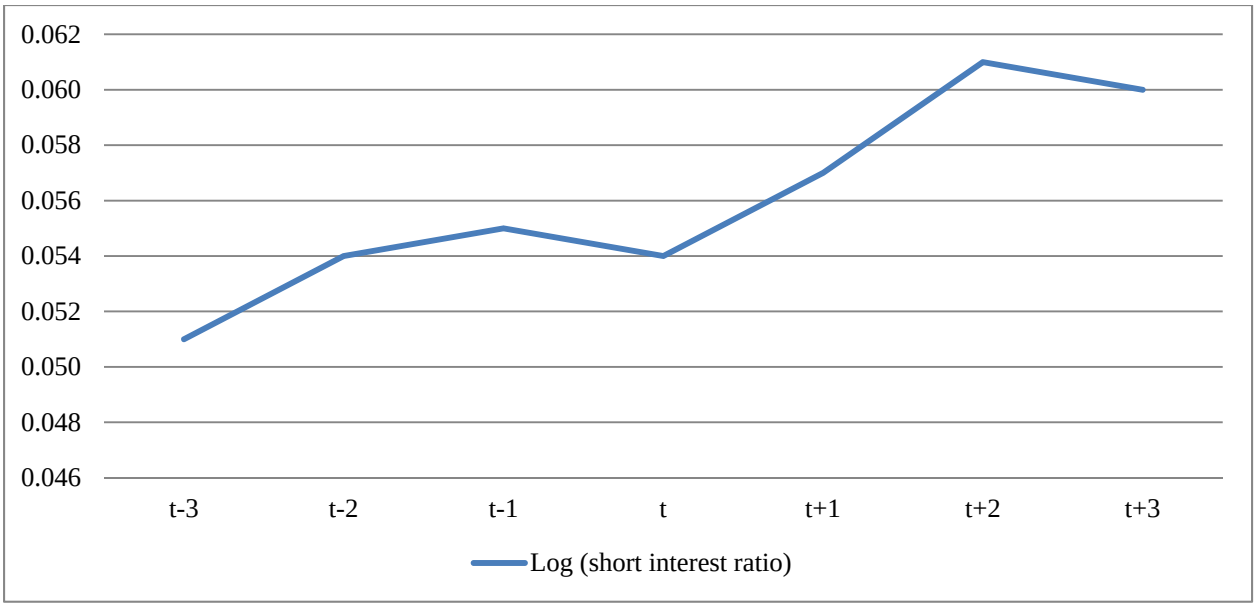

Figure 5. Changes in Stock Repurchases around ETF Inceptions

This figure shows the average ratio of stock repurchases to total assets during the seven-quarter period around ETF inceptions. Quarter *t* is the quarter before ETF inception. The sample includes all ETF firms covered in the CRSP mutual fund file during the period from December 31, 2002 to September 30, 2010.