How Does ETF Arbitrage Affect Firm Size

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JEL classification: G19, G30

Keywords: ETF, Arbitrage, Equity Offering, Corporate Financing

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1 Introduction

Exchange-traded funds (ETFs) are publicly traded open-end funds that passively track indices. In recent years, ETFs have gained significant popularity in developed markets such as the U.S. (Panel A of Figure 1) and have experienced rapid growth in emerging markets like China (Panel B of Figure 1). A distinctive feature of ETFs is that they are purchased and redeemed *in kind* on the primary market, namely, investors offer a basket of *securities* underlying the tracked indices when purchasing ETFs and obtain such securities when redeeming them, rather than using *cash*, which enables *arbitrage* opportunities. When the net asset value (NAV) of an ETF exceeds its market price, investors can buy the ETF on the secondary market, redeem it for the underlying securities, and sell those securities to earn a profit. Conversely, when the NAV is lower than the market price, investors can reverse this process to achieve similar arbitrage gains.

[Insert Figure 1 about here]

Extant literature has extensively examined the effects of ETF ownership, particularly its impact on the stock market (Da & Shive, 2018; Glosten, Nallareddy, & Zou, 2021; Israeli, Lee, & Sridharan, 2017; Pan & Zeng, 2019). Many studies attribute these effects to ETF arbitrage, often employing index reconstitution as a research strategy. Index reconstitution introduces exogenous variation in ETF ownership when stocks are added to or removed from an index due to unexpected changes in trading volume or market value rankings. However, isolating the arbitrage mechanism using this approach is challenging because changes in index membership also influence other factors that can affect stock prices and firms. For instance, analyst attention to a stock may increase or decrease when it enters or exits an index (Chen, Shiu, & Wei, 2019; Denis, McConnell, Ovtchinnikov, & Yu, 2003; Elliott, Van Ness, Walker, & Warr, 2006). Furthermore, Bhattacharya and O'Hara (2018) develop a theoretical model showing that ETF ownership can affect the price informativeness of underlying stocks, even in the absence of arbitrage, as stock market makers adjust their bid and ask prices based on information derived from ETF trading.

This paper addresses this issue using a unique setting in China that allows us to isolate the arbitrage mechanism. We focus on how listed firms are impacted by ETF arbitrage, as extant literature primarily examines the stock market, with the effects of ETFs on firms' characteristics and behaviors remaining relatively underexplored.

A key prerequisite for ETF arbitrage is the ability to instantly complete the trading process. Prior to 2019, achieving same-day (T+0) trading of the Shenzhen Stock Exchange (SZSE) cross-market ETFs and their underlying stocks was challenging due to settlement frictions on the SZSE, which accounted for 40% of China's stock market by market value as of December 2023. Cross-market ETFs track indices whose underlying securities include both those listed on the SZSE and those listed on the Shanghai Stock Exchange

(SSE), another major exchange in China. On October 21, 2019, the SZSE implemented a reform that enabled investors to bypass these settlement frictions. This paper examines how the policy shock differentially affected SZSE cross-market ETFs (hereafter SZC ETFs) compared to other ETFs and how firms with varying exposures to the policy shock were differentially impacted.

The primary objective of this study is to analyze how ETF arbitrage affects firm size and to identify the underlying mechanisms. We use the pre-reform SZSE cross-market ETF ownership of stocks to measure their exposure to the policy shock. This ex-ante measure is exogenous to the policy change, and we verify that it is highly correlated with concurrent ETF ownership. We employ entropy balancing (Hainmueller, 2012) to ensure comparability in various firm characteristics between firms with high and low ex ante ownership.

We employ difference-in-differences (DiD) strategies to examine how firms with higher exposure responded differently compared to those with lower exposure. Our analysis reveals that firms with higher exposure experienced a relative increase in size compared with their lower-exposure counterparts. This growth is uniformly distributed across various asset classes. We conducted an event study and also applied the HonestDiD test proposed by Rambachan and Roth (2023), confirming that the observed effect is not attributable to pretreatment trends.

We argue that enhanced arbitrage opportunities increase investor demand for securities underlying cross-market ETFs, prompting firms to issue more equity, thereby contributing to their larger size. Arbitrage opportunities arise from price discrepancies between ETFs and their underlying stocks in their respective secondary markets. Such discrepancies may emerge due to noise trading in the ETF and stock markets. A more efficient arbitrage process attracts additional investors, thereby increasing demand for ETFs and their underlying securities. Notably, in the Chinese ETF market, investors are not required to be Authorized Participants (APs) to engage in arbitrage.

We provide supporting evidence for the above argument. First, we conduct a comprehensive analysis of the ETF markets. Using a difference-in-differences (DiD) approach, we examine how the trading activity and prices of SZC ETFs and other ETFs responded differently following the reform. Our findings indicate that the primary market for SZC ETFs experienced increased activity in purchases and redemptions after the reform, accompanied by a higher turnover rate. More importantly, the gap between the net asset value (NAV) and the price of ETFs in the secondary market narrowed, a typical outcome of more frequent arbitrage activities. These results suggest that arbitrage activities became more active.

Second, we find that the cost of equity decreased for firms with higher exposure to the policy. In response, these firms engaged in more seasonal equity offerings, leading to an increase in the number of stock shares included in SZC ETFs compared with other

ETFs. Furthermore, the increase in equity enabled firms to borrow more, resulting in higher liabilities and an overall expansion in firm size. This additional capital was distributed evenly across different asset classes.

We rule out several alternative explanations. First, we find no significant changes in stock liquidity for firms with higher policy exposure compared to those with lower policy exposure. Second, we do not observe any improvement in stock price informativeness for firms with high exposure relative to those with low exposure to the policy. These findings differ from those of previous studies that use index reconstruction as the identification strategy. We further elaborate on how to interpret these differences.

This paper contributes to the literature in several ways. First, it introduces a novel setting and methodology to analyze the arbitrage mechanisms of ETFs. Unlike existing studies, which primarily rely on changes in index membership to measure variations in ETF ownership (Ben‐David, Franzoni, & Moussawi, 2018). Our analyses are based on a policy shock that changes the ease of arbitrage. Thus, we can rule out alternative explanations, particularly those related to passive investment by index funds, such as investor attention. Furthermore, our framework can be applied to future research on the implications of ETF arbitrage.

Second, we comprehensively investigate the real effects of ETF arbitrage on firms. While existing literature primarily focuses on the impact of ETFs on the secondary market for constituent stocks, few studies explore their real effects. Notable exceptions include Antoniou, Li, Liu, Subrahmanyam, and Sun (2020), which consider investment-information sensitivity. This study contributes to the literature by documenting the effects of ETF arbitrage on firm size.

Third, our paper relates to the broader literature on the effects of arbitrage on the stock market. Previous studies have investigated how ETF ownership influences stock price informativeness and liquidity, with several identifying significant effects. For instance, Ben-David, Franzoni, and Moussawi (2017) argue that ETF trading enhances the liquidity of underlying securities. In addition, ETF trading improves the price informativeness of underlying securities in terms of short-term performance (Glosten et al., 2021). Using a novel approach, we demonstrate that ETF arbitrage does not produce similar effects. This suggests that the previously documented effects of ETF ownership are likely driven by mechanisms other than ETF arbitrage. Our findings thus complement the existing literature and provide deeper insights into the channels through which ETFs influence the market.

The remainder of this paper is organized as follows: Section 2 provides the institutional background; Section 3 outlines the data and methodology; Section 4 presents and discusses the empirical results; and Section 5 concludes the study.

2 Institutional Background

2.1 Risk-Free Arbitrage through ETFs

An ETF is a type of open-end fund that passively tracks the performance of a basket of securities, typically the constituent stocks of an index. For each ETF, a daily Portfolio Composition File (PCF) is disclosed, providing details of the securities underlying the ETF. ETF shares are purchased and redeemed "in-kind" in the primary market—investors exchange a basket of stocks for ETF shares with the ETF sponsors or use ETF shares to redeem the corresponding stocks. Additionally, ETF shares can be traded freely in the secondary market, where investors buy or sell shares using cash.

In theory, risk-free arbitrage is possible when there is a discrepancy between the market price of the ETF and its NAV. For example, if the market price (A) of the underlying basket of stocks exceeds the market price (B) of the ETF, investors can purchase ETF shares in the secondary market for B units of cash, redeem those shares for the corresponding stocks, and sell the stocks in the market for A units of cash. This process generates a risk-free profit of A - B. During this arbitrage process, the market price of the ETF and its NAV gradually converge. A key distinction between the ETF markets in China and the U.S. is the role of Authorized Participants (APs). In the U.S., APs—appointed by ETF sponsors—act as market makers and facilitate arbitrage. By contrast, the Chinese ETF market allows any investor with sufficient funds to engage in arbitrage directly without relying on APs.

2.2 ETF Trade in China

China's stock and fund markets are dominated by two major exchanges: the SZSE and SSE. A third exchange, the Beijing Stock Exchange (BSE), was established in 2021, but it remained relatively small during the sample period.[2] Both stocks and ETFs are traded on these exchanges. The SZSE accounted for 27.3% of China's ETF market in terms of trading value and 40% of the stock market in terms of market value as of December 2023.[3]

China's ETFs can be classified based on their listing exchanges into SSE ETFs and SZSE ETFs. Alternatively, they can be categorized based on the stock exchange in which the underlying stocks are listed, resulting in two types: single-market ETFs and cross-market ETFs. Single-market ETFs consist of ETFs whose underlying stocks are entirely listed on the same exchange as the ETF itself, whereas cross-market ETFs include ETFs whose underlying stocks are partially listed on other exchanges.[4] The settlement of ETF

[2] At the end of 2023, the total market value of listed firms on the BSE accounted for only 1.45% of that on the SZSE.

[3] The trading value and market value data are sourced from the China Stock Market and Accounting Research database.

[4] For instance, if some of the underlying securities of an ETF listed on the SZSE are traded on the SZSE, while others are traded on the SSE, the ETF is classified as a cross-market ETF.

purchases and redemptions follows the rules of the exchange where the ETF is listed.

Before 2015, the SZSE employed an "over-the-counter in-kind purchase and redemption mode" for cross-market ETFs), which created significant trading frictions for ETF arbitrage. First, when investors sought to purchase cross-market ETFs and sell them in the secondary market, the purchase order was divided into two parts—one for the SSE) and one for the SZSE—by the China Securities Depository and Clearing Corporation (CSDC). The SSE and SZSE processed their respective portions of the order and delivered the underlying stocks to the ETF sponsors. Due to the involvement of the CSDC and the cross-market nature of the transactions, the SSE and SZSE stocks were delivered to the ETF sponsors on day T+1. Consequently, investors received the ETFs on day T+1 and could only sell them on day T+2 or later.

Second, when investors bought ETF shares on the secondary market and redeemed them for the underlying stocks, the CSDC began processing the redemption order on day T. The SSE and SZSE then locked and confirmed the transfer of stocks between the ETF sponsors and the investors. The redeemed stocks were delivered to the investors on day T+1, but they could only sell them on day T+2 or later.

As a result, investors were unable to engage in intraday arbitrage with cross-market ETFs listed on the SZSE. Attempting to profit from the difference between the ETF price and its NAV required completing the arbitrage process on day T+2 or later, by which time changes in the NAV or ETF price could occur, exposing investors to the risk of losses.

2.3 SZSE Reform

In 2015, the SZSE introduced the Real-Time Gross Settlement (RTGS) mode for exchange cash redemption, replacing all underlying stocks (including SSE and SZSE stocks) with a virtual security 159900. Theoretically, this reform allows investors to bypass time lags and execute T+0 transactions under RTGS. However, in practice, RTGS is only available to proprietary accounts of securities companies and a limited number of institutional clients. Moreover, since RTGS requires the substitution of all underlying stocks with cash, investors must pay a "cash substitution premium." Specifically, if investors purchase ETFs on day t, the stock price may rise after t when the ETF sponsor builds positions. To compensate for this risk, investors are required to pay more cash than the stock price at *time t*, further deterring the adoption of RTGS. Notably, although RTGS is technically permitted for cross-market ETFs, it has never been utilized in practice for these instruments.

In 2019, another reform significantly reduced trading frictions. In October 2019, SZC ETFs adopted the "cash replacement for SSE stock" mode, allowing cash to substitute for underlying stocks listed on the SSE during ETF purchases and redemptions. Cross-market ETF purchases are now completed as soon as SZSE stocks and cash for non-SZSE stocks are delivered to ETF sponsors, enabling T+0 transactions. ETF sponsors subsequently use cash to acquire non-SZSE stocks. Similarly, in ETF redemptions,

investors receive SZSE stocks and cash for non-SZSE stocks on the same day (T+0). This reform facilitates intraday transactions of SZC ETFs, and we consider the 2019 reform a shock to SZC ETF arbitrage.

Figure 2 presents the dollar volume and number of shares for ETF transactions, categorized by type, from 2010 to 2021. A notable spike in the trading volume of SZC ETFs is observed for the last quarter of 2019 (Panel B), diverging from the time trend seen in single-market ETFs listed on the Shenzhen Stock Exchange (Panel A). This finding aligns with our argument.

[Insert Figure 2 about here]

3 Empirical Methodology

3.1 Data Sources and Sample Construction

This study examines the China A-share stock market, focusing on corresponding equity ETFs and listed firms.[5] Data are sourced from the China Stock Market and Accounting Research (CSMAR) database and include details on daily stock trading (prices and volumes), corporate financials, equity offerings, ETF characteristics (such as type and listing exchanges), ETF transactions in both primary and secondary markets, and ETF NAV. ETF ownership data are retrieved from the Wind database, which provides the percentage ownership of each ETF for individual stocks. For each stock, we aggregate the ownership percentages of shares held by SZC ETFs to calculate the total SZC ETF ownership for that stock. This information is merged with stock trading and firm financial data for analysis.

Given the accessibility of ETF ownership data, our sample period ends in 2023. To balance the lengths of the pretreatment and treatment periods (spanning from the last quarter of 2019 to the fourth quarter of 2023) and eliminate potential disturbances caused by the 2015 reform (see Section 2.3), we define the sample period as January 2016 to December 2023.

In line with the objectives of this study and data availability, we construct four samples with varying levels of granularity for subsequent analyses. The first sample is at the ETF-day level, used for analyzing the trading activities in the secondary market and the number of shares per ETF. The second sample is at the ETF-quarter level, focusing on purchases and redemptions in the primary market. The third sample is at the stock-day level, used for analyzing stock liquidity. Finally, the fourth sample is at the firm-quarter level, including firms' financial information and quarterly stock returns to assess stock price informativeness.

[5] The China A-share market consists of stocks denominated in Chinese Yuan.

3.2 Empirical Models

Using the 2019 reform introduced in Section 2.3, we conduct DiD analyses on ETFs and listed firms separately. First, we introduce the methodology for the main analyses of firms and stocks. Alternative models for robustness tests are presented along with their results in Section 4.

To ensure a balanced panel, we include only firms that existed throughout the sample period. We then compare firms with varying levels of exposure to the reform and analyze how their behaviors changed differently after the policy shock. Exposure is quantified by the percentage of stock ownership by SZC ETFs in the third quarter of 2019 (2019Q3). The rationale is straightforward: stocks with higher SZC ETF ownership would be more significantly affected by increased arbitrage activity associated with these ETFs. We utilize ETF ownership data for 2019Q3, the quarter immediately preceding the reform, as an ex-ante measure. This metric is exogenous to the reform, alleviating the concerns that ETF ownership might be affected by the policy change. Additionally, we confirm that ETF ownership in 2019Q3 is highly correlated with concurrent ownership (correlation coefficient: 0.44), making it a reliable proxy for variations in ETF ownership in other quarters.

The remaining problem is that firms with differing ex ante ownership of SZC ETFs may differ in other aspects. To address this issue, we apply entropy balancing. Specifically, we focus on observations from 2019Q3 in the firm-quarter sample. Firms are divided into two groups based on their SZC ETF ownership: those with ownership above the mean and those with ownership below the mean. We assign a weight to each firm to ensure that the weighted distribution of financial characteristics is comparable across the groups (i.e., entropy balancing). The key financial characteristics considered include total assets, equity multiplier (leverage), cash-to-total-assets ratio, return on assets (ROA), and Tobin's Q. The lower panel of Table 1 presents the t-tests of the means after balancing. The balanced sample consists of 2,538 firms, and the key financial characteristics are statistically indistinguishable between the two groups after entropy balancing is applied. We assign the time-invariant weights to each firm across all of the firm/stock panel samples, each firm with the same weight throughout the sample period.

[Insert Table 1 about here]

We then estimate the following regression:

$$y_{it} = \beta_0 + \beta_1 SZC_i \times Post + FEs\ (+\ Controls_{it}) + \varepsilon_{its} \qquad (1)$$

The regression is conducted on a daily or quarterly firm-level sample. Here, y_{it} represents a corporate or stock outcome for firm i at time t (quarterly or daily). SZC_i denotes the proportion of the firm's market value owned by SZC ETFs in 2019Q3. We also use a binary treatment variable to replace SZC_i in robustness tests. *Post* is the treatment period dummy variable, which equals one if t equals or is later than 2019Q4 and zero otherwise. The coefficient β_1 on the interaction term $SZC_i \times Post$ captures the net arbitrage

effect of ETFs, which is the main focus of our analysis.

FEs represent year-quarter fixed effects and firm fixed effects, which account for time trends and time-invariant firm characteristics. $Controls_{it}$ refers to time-varying firm financial characteristics. However, controlling for these variables can introduce the "bad control" problem (Angrist & Pischke, 2009): the outcome variable y may affect financial characteristics, and controlling for them can bias the estimates toward zero. Therefore, we avoid including these controls in most regressions, except in one robustness test, where we demonstrate that the results remain largely unchanged after their inclusion. Standard errors are clustered at the firm level.

Second, we analyze the changes in the primary and secondary ETF markets as supporting evidence for the proposed mechanism. To ensure a balanced panel, we include all cross-market ETFs that existed throughout the entire sample period. These ETFs are listed on the SSE and SZSE. Since the reform applies specifically to SZC ETFs, we use SSE cross-market ETFs (hereafter SC ETFs) as the control group and conduct DiD analyses. The control group is restricted to cross-market ETFs, because they are typically linked to indices with broader stock market coverage, distinguishing them from other ETFs. The following regression analyses are performed:

$$y_{it} = \beta_0 + \beta_1 SZ_i \times Post + FEs + \varepsilon_{its} \qquad (2).$$

y_{it} represents an outcome associated with ETF i during period t, measured quarterly or daily. SZ_i is a dummy variable equal to one if the ETF is listed on the SZSE and zero otherwise. *Post* is a dummy variable for the treatment period, equal to one if t equals or is later than 2019Q4 and zero otherwise. The coefficient β_1 captures the effect of the interaction between the treatment period dummy and *SZ* on ETFs. Standard errors are clustered at the ETF level. For the analysis of stock price informativeness, we employ a modified version of Model (2), which is detailed in Section 4.6.

Table 2 presents descriptive statistics for the four samples across its four panels. Panels A and B indicate that the average ex ante SZC ownership is 0.546%, with a standard deviation of 1.315%. In the ETF analyses, 22.2% of ETFs belong to the treatment group. Other variables, primarily the dependent variables used in the two models, are explained alongside the results in Section 4. Table A1 in the Appendix provides a summary of all variables employed in this paper. Certain dependent variables (e.g., assets) are "count-like" data. Cohn, Liu, and Wardlaw (2022) point out that Poisson regression is the appropriate specification for count-like dependent variables, especially when they include zero values, as opposed to transforming them by taking the logarithm of one plus the original value. Consequently, we use Poisson regression for all count-like dependent variables, which we clearly state in the results of each regression. For the other dependent variables, linear regression is used.

[Insert Table 2 about here]

4 Empirical results

4.1 Baseline Results: Firm Size

We begin by employing Model (2) to examine the impact of the reform on firm size. The dependent variable is the firm's total assets, and the sample is the firm-quarter level sample. Given that firm size is a count-like variable, we use Poisson regression. The results are presented in Table 3. Column 1 indicates that a 1% increase in ex-ante SZC ETF ownership is associated with an 8.3% larger firm size. To contextualize this, a one-standard-deviation increase in ex-ante SZC ETF ownership corresponds to a 10.9% increase in firm size (calculated as 8.3% × 1.315%/1%).

To assess the robustness of these findings, we apply alternative model specifications. Section 3.2 provides a detailed explanation of our decision not to include time-varying controls. Nonetheless, we incorporate these controls in Column 2 of Table 3 to demonstrate that the results remain consistent. Additionally, in Column 3, we replace the continuous treatment intensity variable (*SZC*) in Model (1) with a binary treatment indicator (whether SZC ETF ownership in 2019Q3 is higher than the mean). The results continue to show a positive effect on firm assets.

[Insert Table 3 about here]

We also rule out the possibility that our baseline results are driven by preexisting time trends among firms with different policy exposures. To address this, we conduct an event study by replacing the variable *Post* in Model (1) with a year-quarter categorical variable, using 2019Q3 as the reference period. The resulting point estimates and 95% confidence intervals are presented in Panel A of Figure 3. All estimates are statistically insignificant during the pretreatment period, and an upward trend emerges immediately following the reform. Concerns may arise regarding the low point estimates for the period prior to 2018Q4. To address this, we apply the HonestDiD method proposed by Rambachan and Roth (2023) to examine the effects under the assumption that the mild upward pretreatment trend continues into the treatment period. Panel B of Figure 3 illustrates the confidence intervals for the estimates of β_1 in Model (1), both with and without accounting for potential preexisting trends. The first interval, derived without considering preexisting trends, corresponds to the coefficient of *SZC*×*Post* in Column 1 of Table 3. The second interval accounts for potential preexisting trends and has a slightly lower bound than the first but remains above zero. Hence, even when accounting for potential preexisting trends, the effects remain statistically significant at the 5% level.

[Insert Table 3 about here]

[Insert Figure 3 about here]

We conjecture that the observed increases in firm size result from reduced frictions in ETF arbitrage. The reform allows investors to more efficiently exploit the arbitrage opportunities created by noise traders in ETF and stock markets, thereby increasing

demand for related stocks. In response to this heightened demand, firms issue additional equity, which boosts their equity capital. This increase in equity capital enhances firms' borrowing capacity, leading to higher liabilities. Consequently, we observe an overall increase in firm size.

To substantiate this argument, we provide a comprehensive set of evidence in the following sections.

4.2 More Active Arbitrage

This section provides evidence that arbitrage activities increased following the policy shock. ETF markets facilitate arbitrage through two mechanisms: (1) the purchase or redemption of ETF shares in the primary market and (2) the trading of ETF shares in the secondary market. An increase in arbitrage activity implies higher levels of purchases and redemptions in the primary market, as well as increased trading in the secondary market.

First, we demonstrate that purchases and redemptions in the primary market of SZC ETFs have risen. We apply Model (2) to the ETF-quarter level sample, and the dependent variable is the number of ETF share purchases and redemption, respectively. The model compares SZC ETFs with SC ETFs in a DiD framework. Because the dependent variables are count-like measures, Poisson regressions are employed.

Table 4 presents the results. Column 1 indicates that purchases of ETF shares in the primary market increased by 17% for SZC ETFs relative to SC ETFs following the policy shock. These estimates are both statistically and economically significant. Similarly, Column 2 shows that redemptions of ETF shares increased by a comparable magnitude. This evidence supports the argument that transactions in the primary ETF market have become more active.

[Insert Table 4 about here]

We next examine the secondary market for ETFs by applying Model (2) to the ETF-day sample to analyze ETF trading activity. Unlike the primary market, where purchases and redemption transactions can be assessed separately, trading activity in the secondary market is symmetric. Consequently, we use turnover as the dependent variable, defined as the ratio of trading value to the market value of the ETF on a given day. Since the dependent variable is a ratio, we employ a linear regression. The results, shown in Column 3 of Table 4, indicate that turnover increased sharply by 0.678, signifying a substantial rise in trading activity in the secondary market. These findings suggest that the policy successfully stimulated transactions in both the primary and secondary markets.

4.3 Smaller Gaps Between NAV and Price

We then investigate changes in the gap between the ETF price in the secondary market and its NAV, which is a critical test of the increase in arbitrage activity. If arbitrage

activity intensifies, the ETF price and NAV should converge. To assess this, we apply Model (2) to the ETF-day sample. The dependent variable, *GAP*, is constructed by first calculating the percentage difference between the ETF's daily closing price and its daily NAV, defined as the daily closing price divided by the NAV, minus 100%. This difference, which can be positive or negative, is then converted to an absolute value to capture the magnitude of the discrepancy irrespective of its direction.

Table 5 presents the results. The *GAP* variable includes some extreme and unreasonable values in its right tail (e.g., 40), which we mitigate by winsorizing it at the 99.9th percentile. We report the results both with and without winsorization in Columns 1 and 2, respectively. The findings reveal that the discrepancy between price and NAV decreased by 0.3%, equivalent in magnitude to the mean *GAP*, signifying a notable improvement in the arbitrage process.

[Insert Table 5 about here]

Overall, the results demonstrate that the policy increases activity in both the primary and secondary ETF markets while narrowing the *GAP* between ETF prices and NAVs. This evidence suggests a significant improvement in the arbitrage process.

4.4 Cost of Equity and Equity Offering

Next, we examine the decline in the cost of equity as evidence of increased demand for firm stocks following the reform. However, we cannot isolate the effect of the ETF arbitrage-induced demand shock on the cost of equity while holding other factors constant. This limitation arises because firms respond to the reduced cost of equity by issuing more equity, which, in turn, raises the cost of equity and (at least partially) *offsets* the initial decline. As a result, we capture only the net change in the cost of equity, reflecting a general equilibrium where both equity demand and supply adjust. With this in mind, we proceed with the following tests.

We employ the price-earnings-growth (PEG) model proposed by Easton (2004) to estimate and measure the cost of equity, defined as:

$$Equity_cost_{i,t} = \sqrt{\frac{EPS_{i,t+2} - EPS_{i,t+1}}{P_{i,t}}} \quad (3)$$

where $EPS_{i,t+1}$ and $EPS_{i,t+2}$ represent the projected net income per share of firm i for years t+1 and t+2, respectively, while P_i is the stock price of firm i at the end of year t. Hou, Van Dijk, and Zhang (2012) demonstrated that earnings forecasts based on this model outperform those of analysts and provide broader sample coverage. Following their methodology, we conduct an out-of-sample earnings forecast. For each year y in the sample, we utilize data from the previous ten years (y -10 to y -1) to estimate the following model:

$$E_{i,t+\tau} = \alpha_0 + \alpha_1 Asset_{i,t} + \alpha_2 D_{i,t} + \alpha_3 DD_{i,t} + \alpha_4 E_{i,t} + \alpha_5 NegE_{i,t} + \alpha_6 AC_{i,t} + \varepsilon_{i,t+\tau} \quad (4)$$

where t represents any year in the first five years of the decade (y-10 to y-6). The term $E_{i,t+\tau}$ refers to the earnings of firm i in year $t+\tau$ (τ=1, 2 , …, 5), meaning that for each year y, the

model is estimated five times. $Asset_{i,t}$ denotes the total assets of firm i at the end of year t, $D_{i,t}$ is the dividends paid by firm i in year t, and $DD_{i,t}$ is a dummy variable equal to 1 if firm i pays dividends in year t and 0 otherwise. Similarly, $NegE_{i,t}$ is a dummy variable equal to 1 if firm i reports negative earnings in year t and 0 otherwise. $AC_{i,t}$ represents accruals.

For each firm i in year y, we estimate the coefficients of the Model (4) and calculate the predicted earnings $E_{i,y+1}$ and $E_{i,y+2}$. To estimate $EPS_{i,t+1}$ and $EPS_{i,t+2}$, we divide the forecasted earnings $E_{i,y+1}$ *and* $E_{i,y+2}$ by $Stknum_{i,y}$, the number of common shares of firm i at the end of year t:

$$EPS_{i,y+\varphi} = E_{i,y+\varphi}/Stknum_{i,y} \quad \varphi = 1,2 \qquad (5).$$

Finally, we calculate the cost of equity for firm i in year t using Equation (3).

We use the cost of equity as the dependent variable and apply Model (1) to a firm-quarter sample. The results, reported in Column 1 of Table 6, show that the cost of equity declined by 0.2%. This finding suggests that firms with higher policy exposure experience a greater decline in the cost of equity. As noted earlier in this section, this decline reflects the net effect of increased equity demand and a corresponding rise in equity supply driven by this demand. Consequently, the estimates likely understate the actual effects of increased demand, which explains why the result is significant only at the 10% level.

Next, we examine the extent to which equity capital increased due to higher equity offerings. It is important to note that changes in firms' equity may result from various factors; here, we isolate the portion attributable to equity offerings. Since equity offerings are infrequent, we construct a "cumulative equity offering" measure for each quarter by summing the value of all seasonal equity offerings (SEOs) from the start of the sample period (2016Q1) to that quarter. We use this cumulative equity offering as the dependent variable and apply Model (1) to the firm-quarter sample, with the results presented in Column 2 of Table 6. Given that the dependent variable is a count-like measure, we employ a Poisson regression, where the estimates represent percentage changes. The findings indicate that firms with higher policy exposure experienced a larger increase in equity due to SEOs.[6]

[Insert Table 6 about here]

4.5 Firm Equity and Liability

In this section, we analyze various components of the balance sheet to examine how increased equity offerings affect firms. First, we use equity as the dependent variable, distinguishing this analysis from the previous section, which focused on the increase in equity directly attributable to equity offerings. Equity may grow by a greater margin than the equity offering itself due to several factors. For instance, improved access to equity

[6] Another approach involves examining the occurrence of SEOs. However, since SEOs are rare events, detecting significant increases is difficult.

financing enables firms to better exploit investment and growth opportunities, accelerating their growth. Using equity as the dependent variable, we quantify the *overall impact* of the reform on equity growth. The results, presented in Column 1 of Table 7 show that equity increases more rapidly for firms with greater policy exposure. Notably, the point estimate is larger than the effect observed in the previous section (10% versus 4.3%).

Next, we replace the dependent variable with total firm liability. Our findings reveal that liability also increases, which is expected since firms with more capital are able to borrow more. In combination, the increases in equity and liability indicate that firms acquire more capital to support their investments.

We next examine the asset side of the balance sheet. In Section 4.1, we observed an increase in total assets. Here, we investigate how the components of total assets have changed. Total assets are categorized into four groups: current assets, fixed assets (property, plant, and equipment), intangible assets, and other assets. We use these four asset types as dependent variables in separate Poisson regressions, employing Model 1. Table 7 presents the results, which indicate that most asset classes, except intangible assets, experienced increases in firms with higher policy exposures. The stability of intangible assets is intuitive, as they exhibit economies of scale and typically do not require expansion when a firm's production scale increases. These findings suggest that when firms gain access to additional capital, they allocate it in a coordinated manner. Thus, the overall increase in total assets does not stem from anomalous changes in specific asset categories.

[Insert Table 7 about here]

4.6 Alternative Explanations

We also rule out potential alternative explanations. First, the literature highlights that ETF trading can affect the liquidity of underlying securities, although the direction of this effect remains debated. For instance, Marshall, Nguyen, and Visaltanachoti (2013) argue that arbitrage activities increase the liquidity of underlying securities. Conversely, some studies suggest that during arbitrage, stocks are traded in baskets, resulting in most shares being "locked" within these baskets, which crowds out liquidity for other traders (Dannhauser, 2017; Piccotti, 2014). Consequently, liquidity could either increase or decrease with heightened ETF trading. If the effect is positive, higher liquidity could drive greater demand for these stocks, subsequently increasing firm equity and size.

To explore this alternative explanation, we examine the impact of the policy on stock liquidity. Specifically, we use Model (1) with the daily illiquidity measure proposed by Amihud (2002) as the dependent variable. The results, presented in Column 1 of Table 8, indicate that liquidity does not experience a significant change. Therefore, it is unlikely that changes in liquidity serve as the mechanism through which ETF arbitrage affects firm size.

[Insert Table 8 about here]

Second, ETF trading may also affect the price informativeness of stocks. For example, Glosten et al. (2021) and Israeli et al. (2017) show that ETF trading can either enhance or diminish stock price informativeness. (These studies are based on index reconstitution and cannot isolate the arbitrage mechanism, as discussed in Section 1.) It is possible that investors increase demand if the stock price informativeness is improved by ETF arbitrage.

We investigate stock price informativeness using the following model:

$$RET_{it} = \beta_0 + \beta_1 SZC_i \times Post \times EARN_{it} + \beta_2 SZC_i \times Post_{it} + \beta_3 SZC_i \times EARN_{it} + \beta_3 SZC_i \times EARN_{it} + Ctrl_{it} + FEs + \varepsilon_{it} \quad (6).$$

Here, RET_{it} represents the return of stock i in quarter t. The variables SZC_i and $Post$ are identical to their definitions in Model 1. $EARN_{it}$ denotes the adjusted earnings per share for stock i in quarter t, following the methodology of Glosten et al. (2021). $EARN_{it}$ is calculated as:

$$EARN_{it} = (X_{i,t} - X_{i,t-4})/P_{i,t-1} \quad (7)$$

where $X_{i,t}$ represents the earnings per share excluding extraordinary items for firm i in quarter t, and $P_{i,t-1}$ is the closing stock price at the end of quarter $t-1$. Since $X_{i,t}$ is disclosed after RET_{it} is realized, Model (6) examines how much information about $EARN_{it}$ is embedded in RET_{it}.

β_1, the coefficient of $SZC_i \times Post \times EARN_i$, captures how the reform affects the information contained in RET_{it}. To ensure a full triple-differences (DDD) specification, we control for the three two-way interaction terms ($SZC_i \times Post$, $SZC_i \times EARN_{it}$, and $SZC_i \times EARN_{it}$). $Ctrl_{it}$ includes other control variables used by Glosten et al. (2021): $INST_residual_{it}$, the part of variation in institutional ownership that is orthogonal to SZC_{it}; the interaction of $INST_residual_{it}$, which represents the portion of institutional ownership variation orthogonal to SZC_i; the interaction of $INST_residual_{it}$ with $EARN_{it}$; the lagged market-to-book ratio (MTB_{it-1}); the lagged natural logarithm of market value of equity ($Size_{it-1}$); the standard deviation of $EARN_{it}$ during the past twenty quarters preceding quarter t ($EARN_STD_{i(t-20,t-1)}$); a dummy variable ($LOSS_{it}$) equal to 1 if quarterly earnings for firm ii are negative and 0 otherwise; the interaction of $LOSS_{it}$ with $EARN_{it}$; the interaction terms $EARN_{it-1} \times SZC_i \times Post$, $EARN_{it-1} \times SZC_i$, and $EARN_{it-1} \times Post$; the lagged market beta of stock i (β_{it-1}), which is provided by CSMAR and is estimated using data in the year preceding quarter t; the lead stock return (RET_{it+1}). Notably, $INST_residual_{it}$ is derived as the residual from the regression:

$$INST_{it} = \beta_0 + \beta_1 \times SZC_{it} + \varepsilon_{it} \quad (8)$$

where $INST_{it}$ is the institutional ownership rate for firm i in quarter t, and SZC_i represents the ownership of SZC ETF for stock i at the end of quarter t.[7]

[7] The control variables used in this study are similar, but not identical, to those in Glosten et al. (2021). This is because our identification strategy differs, and we have modified the variables to align them with our main independent variable, $SZC \times Post$.

The results are presented in Table 9. In Column 1, where the control variables (*Ctrl*) are excluded, the coefficient for $SZC_i \times Post \times EARN_i$ is statistically insignificant, suggesting little change in stock price informativeness associated with increased ETF arbitrage activity. In Column 2, after including *Ctrl*, the coefficient becomes weakly statistically significant at the 10% level. Notably, the point estimate is *negative* (-0.027), indicating a potential *decline* in stock price informativeness, if any. This evidence suggests that increased investor demand is unlikely driven by improvements in stock price informativeness.

It is important to note that our findings do not necessarily contradict existing research. ETF ownership may affect stock price informativeness through mechanisms other than arbitrage. For instance, market participants might extract information from ETF trading, which can impact stock prices (Bhattacharya & O'Hara, 2018). Additionally, ETF ownership could be linked to heightened market attention, as stocks generally receive more attention after being added to an index (Ben-David, Franzoni, Kim, & Moussawi, 2023). Thus, the findings regarding the effects of ETF ownership in existing studies may be driven by channels other than arbitrage.

In summary, the evidence in this section not only rules out alternative explanations but also provides novel insights into how ETF arbitrage may affect stock price informativeness and liquidity. This analysis leverages a policy shock, offering a clean setting to identify the arbitrage mechanism.

[Insert Table 9 about here]

5 Conclusion

This paper exploits a unique setting and a policy shock in China to identify how ETF arbitrage affects firms. We find that reduced frictions in ETF arbitrage lead to growth in firm size, particularly for firms whose stocks are more exposed to arbitrage. Regarding the mechanism, the reform stimulated transactions in both the primary and secondary ETF markets and narrowed the gap between ETF prices and NAV, indicating more efficient arbitrage. Consequently, the cost of equity decreased for firms with greater policy exposure, reflecting heightened demand for their stocks driven by an improved arbitrage process. In response, these firms increased their equity offerings, enabling them to borrow more debt and expand their size. Notably, firms allocated the additional capital evenly across different asset classes. We rule out alternative explanations related to liquidity and stock price informativeness.

This study contributes to the literature in several aspects. First, it identifies how ETF arbitrage affects firm size, an essential dimension of the real effects of ETFs. Second, the study introduces a unique policy setting that provides a useful framework for future research on ETF arbitrage. Third, it offers novel evidence on how ETF arbitrage impacts

stock price informativeness and liquidity, which helps us better understand the existing debate in the literature.[8]

[8] Declaration of generative AI and AI-assisted technologies in the writing process: During the preparation of this work, the author used ChatGPT to copyedit the manuscript. The author subsequently reviewed and revised the content as needed and assumes full responsibility for the publication's content.

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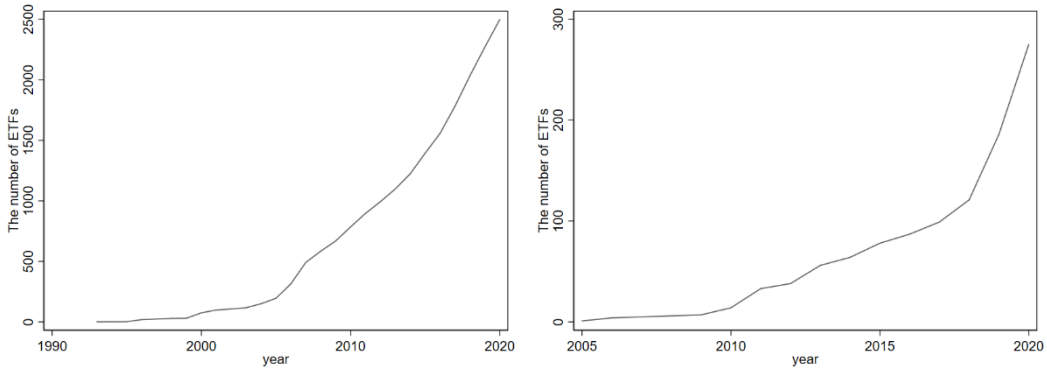
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Figure 1 The number of ETFs

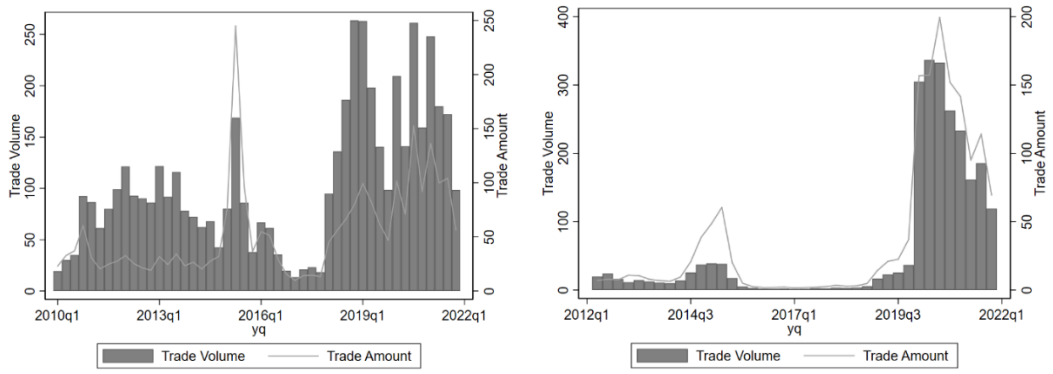
Panel A: U.S Panel B: China



This figure plots the number of ETFs in the U.S. and China. The first ETF in the U.S. was listed in 1993, and the first ETF in China was listed in 2005.table

Figure 2 Trading Activities by ETF Types

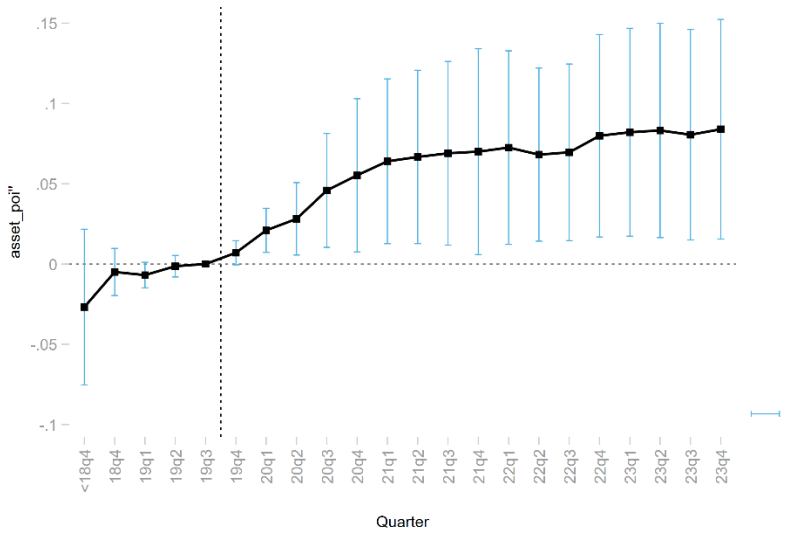
Panel A: Shenzhen Stock Exchange Single-market Panel B: Shenzhen Stock Exchange Cross-market



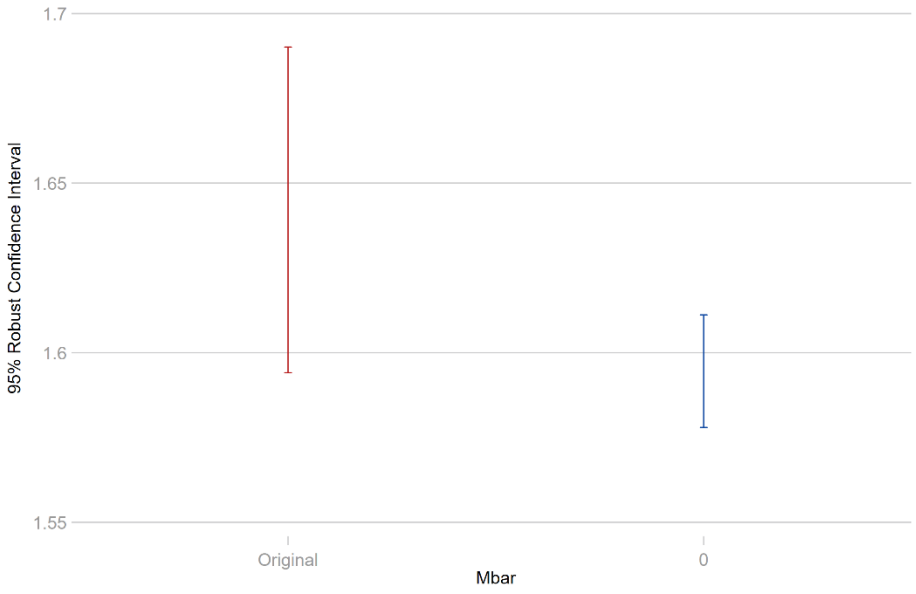
This figure plots the dollar volume and number of shares traded for the two types of ETFs from 2010 to 2021.

Figure 3 Event Study and HonestDiD

Panel A: Event Study



Panel B: HonestDiD



This figure displays the analyses of the pretreatment trend. Panel A plots the point estimates and 95% confidence interval for *SZC* × *Year-Quarter* in the event study. The reference period is the third quarter of 2019. Panel B displays the HonestDiD analyses, where the second confidence interval is the one for *SZC* × *Post* and is obtained after assuming potential pretreatment trend persist during the treatment period.

Table 1 Entropy Balancing

Variable	Obs	SZC ETF<Mean	SZC ETF>=Mean	Diff
Before Balancing				
Ln(asset)	2626	22.19	23.782	1.5914***
		[0.028]	[0.058]	[0.0569]
Leverage	2626	2.136	2.434	0.2987***
		[0.039]	[0.066]	[0.0749]
Cash ratio	2610	0.136	0.148	0.0123***
		[0.002]	[0.004]	[0.0045]
ROA	2626	0.027	0.04	0.0125***
		[0.001]	[0.001]	[0.0018]
Tobin's Q	2554	1.763	1.86	0.097
		[0.035]	[0.056]	[0.0652]
After Balancing				
Ln(asset)	2538	23.694	23.694	0
		[0.034]	[0.053]	[0.0570]
Leverage	2538	2.268	2.269	0
		[0.029]	[0.046]	[0.0495]
Cash ratio	2538	0.148	0.148	0
		[0.002]	[0.004]	[0.0041]
ROA	2538	0.04	0.04	0
		[0.001]	[0.002]	[0.0016]
Tobin's Q	2538	1.874	1.874	-0.0001
		[0.037]	[0.057]	[0.0615]

The table presents the results of entropy balancing.

Table 2 Descriptive Statistics

Panel A The Firm-Quarter Level Sample

Variable	Obs	Mean	Std.dev.
SZC (%)	81,216	0.546	1.315
Post	81,216	0.531	0.499
Total Assets	81,216	3.24×10^{10}	2.25×10^{11}
Cumulated SEO	81,216	2.57×10^{9}	6.17×10^{9}
Equity	81,216	1.05×10^{10}	4.68×10^{10}
Liability	81,216	2.19×10^{10}	1.91×10^{11}
Current Assets	81,216	1.27×10^{10}	6.43×10^{10}
Fixed Assets	81,213	4.78×10^{9}	2.43×10^{10}
Intangible Assets	81,216	1.11×10^{9}	6.41×10^{9}
Other Assets	81,213	1.38×10^{10}	1.99×10^{11}
Lever	81,216	2.291	5.786
Cash ratio	81,213	0.156	0.110
ROA	78,678	0.021	0.053
Tobin's Q	79,940	2.044	4.097
Cost of Equity	51,376	0.118	0.073
Return	79,036	-0.006	0.223
EARN	78,609	0.002	0.282

Panel B The Firm-Daily Sample

Variable	Obs	Mean	Std.dev.
SZC (%)	4,806,949	0.55	1.31
Post	4,806,949	0.54	0.50

Panel C The ETF-Quarter Level Sample

Variable	Obs	Mean	Std.dev.
SZ (%)	2,304	0.222	0.416
Post	2,304	0.531	0.499
Redemption	2,304	4.52E+08	1.61E+09
Purchase	2,304	5.43E+08	1.91E+09
GAP	436,052	0.003	0.062

Panel D The ETF-day Sample

Variable	Obs	Mean	Std.dev.
SZ (%)	150,192	0.222	0.416
Post	150,192	0.524	0.499
Turnover	150,192	0.017	0.048

The table presents the descriptive statistics for the four samples.

Table 3 Firm Size

	(1)	(2)	(3)
Dep. var.	Baseline	Add Control	Binary Treatment
SZC×Post	0.083**	0.090***	0.200**
	(2.03)	(2.59)	(2.27)
Lever		0.010	
		(0.51)	
Cash ratio		-0.217	
		(-0.78)	
ROA		-0.425	
		(-0.64)	
Tobin's Q		-0.081**	
		(-2.34)	
Institutional Ownership		0.015***	
		(0.002)	
Year-Quarter FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	81216	65830	81216
Pseudo R^2	0.989	0.991	0.987
Mean DV	8.49e+10	8.96e+10	7.69e+10

This table presents the results for the regressions of the effects on firm size. All the three columns use Poisson regression. The robust standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 4 More Active Arbitrage

	(1)	(2)	(3)
Dep. var.	Purchase	Redemption	Turnover
SZ×Post	1.166***	1.370***	0.678**
	(3.27)	(3.94)	(2.07)
Year-Quarter FE	Yes	Yes	
Year-Daily FE			Yes
Firm FE	Yes	Yes	
Observations	2304	2304	150192
Pseudo R^2	0.866	0.869	
R^2			0.127
Mean DV	5.43e+08	4.52e+08	0.017

This table presents the results for the regressions of the effects of the reform on ETF purchase and redemption on the primary market and turnover on the secondary market. Columns (1) and (2) use Poisson regressions, and Column (3) uses a least squares regression. The robust standard errors are clustered at the ETF level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 5 The Gap Between ETF Prices and NAVs

	(1)	(2)
Dep. var.: GAP	Winsorized	Non winsorized
SZ×Post	-0.003***	-0.003***
	(-3.53)	(-3.30)
Year-Quarter FE	Yes	Yes
Firm FE	Yes	Yes
Observations	436052	436052
R-squared	0.307	0.004
Mean DV	0.003	0.003

This table presents the results for the least squares regressions of the effects on the gap between ETF prices and NAVs. The robust standard errors are clustered at the ETF level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 6 Cost of Equity and Cumulative SEO

	(1)	(2)
Dep. var	Cost of Equity	Cumulative SEO
SZC×Post	-0.002*	0.043**
	(-1.77)	(2.45)
Year-Quarter FE	Yes	Yes
Firm FE	Yes	Yes
Observations	51376	61440
Pseudo R^2		0.928
R^2	0.533	
Mean DV	0.098	6.33×10^9

This table presents the results of the regressions of the effects on cost of equity and cumulative SEO. Columns (1) uses a least squares regression, and Column (2) uses a Poisson regression. The robust standard errors are clustered at the firm level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 7 Changes in Balance Sheet Items

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. var.	Equity	Liabilities	Current Assets	Fixed Assets	Intangible Assets	Other assets
SZC×Post	0.100**	0.064**	0.035**	0.125*	-0.002	0.098**
	(2.08)	(2.52)	(2.02)	(1.65)	(-0.06)	(2.01)
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	81216	81216	80352	81213	81056	81165
Pseudo R-squared	0.987	0.985	0.979	0.980	0.974	0.992
Mean DV	2.57e+10	5.13e+10	2.94e+10	1.53e+10	3.50e+09	3.73e+10

This table presents the results for the regressions of the effects of the reform on major items on the balance sheet. All columns use Poisson regressions. The robust standard errors are clustered at the ETF level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 8 The Impact on Stock Liquidity

Dep. var.	Illiquidity
SZC×Post	-0.000
	(-0.90)
Year-Quarter FE	Yes
Firm FE	Yes
Observations	4806949
R-squared	0.045
Mean DV	0.001

This table presents the results for the least squares regressions of the effects of the reform on stock liquidity. The robust standard errors are clustered at the stock level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 9 Stock Price Information Efficiency

Dep. var.: RET	(1)	(2)
EARN	0.014	0.007
	(1.03)	(0.49)
EARN × SZC × Post	-0.014	-0.027*
	(-1.43)	(-1.73)
EARN × Post	-0.012	-0.016
	(-1.05)	(-1.47)
SZC × Post	0.001	0.002
	(0.84)	(1.63)
EARN × SZC	0.024***	0.049***
	(2.76)	(3.47)
INST_residual		-1.136
		(-1.59)
INST_residual × EARN		-6.707**
		(-2.48)
MTB		-0.000
		(-0.37)
Size		-0.124***
		(-21.26)
EARN_STD		-0.002
		(-0.31)
LOSS		-0.037***
		(-7.52)
LOSS × EARN		0.008
		(1.20)
$EARN_{it-1}$ × SZC × Post		0.025*
		(1.93)
$EARN_{it-1}$ × SZC		0.004
		(1.54)
$EARN_{it-1}$ × Post		-0.031***
		(-2.94)
Beta		-0.005
		(-0.74)
RET_{it-1}		-0.113***
		(-13.25)
Year-Quarter FE	Yes	Yes
Firm FE	Yes	Yes
Observations	80017	79053
R-squared	0.221	0.277

Mean DV	0.002	0.002

This table presents the results for the least squares regression of the effects of the reform on stock price informativeness. The robust standard errors are clustered at the stock level and are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Appendix

Table A1 Variable Definition

Variable	Definition	Level
AC	Accruals	Firm-Year
Assets	The total assets of a firm	Firm-Quarter
Beta	the lagged value of the market beta of the stock, which is provided by CSMAR and is estimated using data in the year preceding quarter *t*	Firm-Quarter
EARN	Seasonally adjusted earnings	Firm-Quarter
EPS	The forecast of the net income per share	Firm-Year
Cash ratio	Total cash divided by total assets	
Cost of Equity	The financing cost of equity as described in Section 4.4	Firm-Year
D	Cash dividend	Firm-Year
DD	The dummy variable which equals 1 if the firm pays dividends in the year and 0 otherwise	Firm-Year
EARN_STD	The standard deviations of $EARN_{it}$ during the past twenty quarters preceding quarter *t*	Firm-Quarter
GAP	The daily closing price of ETF divided by its daily NAV and minus 100%, then taking the absolute value	ETF-Day
INST	Institutional ownership	Firm-Quarter
INST_residual	institutional ownership that is not explained by SZC_{it}	Firm-Quarter
Lever	Total assets divided by equity	Firm-Quarter
LOSS	a dummy that equals one if the earnings are negative and zero otherwise	Firm-Quarter
MTB	Market-to-book ratio	Firm-Quarter
NegE	A dummy that equals 1 if the earnings of a firm is negative and 0 otherwise.	Firm-Year
P	The stock price of a stock at the end of a year	Firm-Year
Post	A dummy that equals 1 after the policy reform and 0 otherwise.	Semi-annual/ Quarter/Year
RET	The return of a stock in a quarter	Firm-Quarter
ROA	The return on assets	Firm-Year
Stknum	The number of common shares of the firm at the end of the year	Firm-Year
SZ	A dummy equals 1 if the ETF is listed on SZSE and 0 otherwise	ETF
SZC	The value of SZSE ETF ownership for the last period before the reform	Firm
X	Earnings per share excluding extraordinary items for a firm in a quarter	Firm-Quarter

This table summarizes the variables in the paper.