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Do ETFs Increase Volatility?

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1 Big picture

- **Question.** Do exchange-traded funds increase volatility in the stocks they hold?
- **Main mechanism.** ETFs provide very cheap, intraday, basket-level trading. This attracts short-horizon liquidity traders. ETF arbitrage then transmits ETF-level demand shocks into the underlying securities.
- **Core contrast.** ETFs could either reduce volatility by buffering demand shocks, or increase volatility by making underlying stocks inherit ETF demand shocks. The paper tests which force dominates.
- **Main empirical result.** Stocks with higher ETF ownership have higher daily volatility. The relation is positive in OLS and remains positive under a Russell-index reconstitution instrument.
- **Identification.** The paper exploits the Russell 1000/Russell 2000 cutoff. Switching from Russell 1000 to Russell 2000 mechanically raises ETF ownership; switching the other way lowers it.
- **Mechanism evidence.** ETF ownership attracts high-turnover traders to underlying stocks, ETF flows create same-day price pressure, and much of that price pressure reverses over subsequent days.
- **Noise versus information.** The reversal evidence and negative return autocorrelation suggest that the volatility increase is at least partly nonfundamental rather than simply faster price discovery.
- **Limits-to-arbitrage evidence.** The volatility effect is tied to ETF mispricing and is weaker when arbitrage is more costly, such as when bid-ask spreads or lending fees are high.
- **Asset-pricing implication.** Stocks with high ETF ownership earn a premium. A high-minus-low ETF ownership portfolio earns statistically significant monthly alphas of about 30–38 bps in the full sample and up to about 56 bps in later subsamples.
- **Takeaway.** ETF ownership is not purely a passive wrapper. Through arbitrage and liquidity trading, ETFs can add a new layer of demand shocks to individual stocks.

2 Data and measurement

2.1 Main sample and ownership measures

- The sample covers U.S. equity ETFs and U.S. stocks from January 2000 to December 2015.
- The main stock universes are S&P 500 stocks and Russell 3000 stocks.
- ETF ownership of stock i at time t is the fraction of stock i's market capitalization held by ETFs.
- The paper also measures ownership by index mutual funds, active mutual funds, and hedge funds to separate ETF effects from general institutional ownership.
- ETF ownership rises sharply over the sample: in S&P 500 stocks, ETF ownership grows from about 0.14% of market capitalization in 2000 to about 7.05% in 2015.

Interpretation. ETF ownership is the treatment intensity. It measures how strongly stock prices are exposed to arbitrage trades triggered by ETF-level demand.

2.2 Volatility and liquidity variables

- Monthly stock-level volatility is computed from daily returns within the month.
- Daily intraday volatility is computed from high-frequency returns and is used in arbitrage-channel tests.
- Liquidity controls include inverse price, Amihud price impact, bid-ask spread, and turnover.

- Standard return predictors include market capitalization, book-to-market, past 12-month returns, and gross profitability.

Interpretation. The controls are designed to separate ETF ownership from size, liquidity, valuation, momentum, profitability, and preexisting volatility.

2.3 Investor trading horizon: churn ratio

The paper uses an Ancerno trade-level measure of how frequently institutions buy and sell the same security. For manager k, security i, and quarter q,

$$\text{Churn Ratio}_{k,i,q} = 1 - \frac{|\$BuyTrades_{k,i,q} - \$SellTrades_{k,i,q}|}{\$BuyTrades_{k,i,q} + \$SellTrades_{k,i,q}}. \tag{1}$$

To incorporate repeated direction changes, the adjusted churn ratio is

$$\text{Adjusted Churn Ratio}_{k,i,q} = \text{Churn Ratio}_{k,i,q} \times \frac{N_{k,i,q} + 1}{2}, \tag{2}$$

where $N_{k,i,q}$ is the number of times the trade direction switches during the quarter.

Interpretation. ETFs should attract higher-churn investors if their low trading costs make them preferred vehicles for short-horizon trading.

2.4 ETF flows and stock-level exposure

ETF flows are measured at the ETF level and aggregated to the stock level according to ETF holdings:

$$Flows_{i,t} = \frac{\sum_{j=1}^{J} w_{i,j,t}\, \$Flows_{j,t}}{\$Volume_{i,t}}, \tag{3}$$

where $w_{i,j,t}$ is ETF j's ownership weight in stock i and the denominator is the stock's recent trading volume.

Interpretation. If ETF flows are liquidity shocks, they should push stock prices in the same direction initially and then reverse.

2.5 Russell-index instrument

- The Russell 1000 contains the largest 1,000 firms; the Russell 2000 contains the next 2,000.
- Around the cutoff, stocks switching from Russell 1000 to Russell 2000 receive more ETF ownership because they become larger weights in Russell 2000-linked ETFs.
- Stocks switching from Russell 2000 to Russell 1000 experience a decline in ETF ownership.
- The paper uses the switch indicator as an instrument for ETF ownership in a local sample around the cutoff.

Interpretation. The index cutoff provides quasi-exogenous variation in ETF ownership that is less likely to be driven by volatility itself.

3 Models and empirical specifications

3.1 Liquidity-shock propagation

The paper's central mechanism can be summarized as

ETF liquidity shock → ETF price moves → ETF arbitrage → basket stocks trade → stock prices inherit shock.

Interpretation. The ETF is not merely a passive ownership vehicle. Its trading can move the underlying securities through the arbitrage process.

3.2 Baseline OLS volatility regression

The baseline monthly specification is

$$Volatility_{i,t} = \alpha_i + \delta_t + \beta ETFOwnership_{i,t-1} + \Gamma' X_{i,t-1} + \varepsilon_{i,t}, \tag{4}$$

where α_i are stock fixed effects, δ_t are month fixed effects, and X includes size, liquidity, return predictors, lagged volatility, and other institutional ownership.

Interpretation. A positive β means that a stock becomes more volatile when a larger fraction of it is held by ETFs, after comparing the stock to itself and controlling for aggregate time shocks.

3.3 Russell IV design

The first stage is

$$ETFOwnership_{i,t} = \alpha_i + \delta_t + \pi Switch_i + \Gamma' X_{i,t-1} + u_{i,t}. \tag{5}$$

The second stage is

$$Volatility_{i,t} = \alpha_i + \delta_t + \beta \widehat{ETFOwnership}_{i,t-1} + \Gamma' X_{i,t-1} + \varepsilon_{i,t}. \tag{6}$$

Interpretation. The instrument changes ETF ownership mechanically through index membership. The exclusion restriction is that index switching affects volatility only through ETF ownership, conditional on controls and local rank polynomials.

3.4 ETF flows and return reversal

The flow-return tests estimate how stock returns respond to ETF-induced stock-level flows at different horizons:

$$r_{i,t+h} = \alpha_i + \delta_t + \beta_h Flows_{i,t} + \Gamma' X_{i,t} + \varepsilon_{i,t+h}. \tag{7}$$

Interpretation. If $\beta_0 > 0$ and later $\beta_h < 0$, ETF flows create temporary price pressure rather than purely revealing fundamentals.

3.5 Variance-ratio tests

The paper studies whether ETF ownership makes stock prices deviate from a random walk by using variance-ratio outcomes.

- A random walk implies a variance ratio close to one.
- Negative autocorrelation implies a variance ratio below one.
- The paper uses both the absolute deviation from one and the signed variance ratio.

Interpretation. Higher ETF ownership should raise mean reversion if ETFs add nonfundamental liquidity shocks.

3.6 Limits-to-arbitrage regression

The arbitrage-channel tests interact stock-level ETF mispricing with arbitrage-cost proxies:

$$IntradayVol_{i,t} = \alpha_i + \delta_t + \beta |Mispricing|_{i,t-1} + \theta |Mispricing|_{i,t-1} \times HighCost_{i,t-1} + \Gamma' X_{i,t-1} + \varepsilon_{i,t}. \tag{8}$$

Interpretation. If ETF arbitrage transmits shocks, ETF mispricing should predict next-day stock volatility. If arbitrage is costly, the effect should be weaker; thus $\theta < 0$ for high bid-ask spreads or high lending fees.

3.7 ETF ownership premium

The asset-pricing tests form monthly quintile portfolios sorted on lagged ETF ownership and estimate factor-model alphas for

$$R_t^{HighETF} - R_t^{LowETF}.$$

The paper also runs Fama–MacBeth regressions of abnormal returns on lagged ETF ownership and contemporaneous ETF flows.

Interpretation. If ETF-induced volatility creates systematic risk, investors require compensation for holding high-ETF-ownership stocks.

4 Identification and empirical design

4.1 What OLS shows

- OLS provides a broad full-sample relation between ETF ownership and volatility.
- Stock fixed effects absorb time-invariant stock characteristics.
- Month fixed effects absorb market-wide volatility shocks.
- Controls account for liquidity, size, valuation, profitability, momentum, lagged volatility, and other institutional ownership.

Interpretation. OLS is informative but not definitive because ETF ownership may be endogenous to the stocks that ETF sponsors choose to hold and to investor demand for certain stocks.

4.2 Why Russell reconstitution helps

- The Russell cutoff changes index-linked ETF demand mechanically.
- Around the cutoff, firms are similar in size but receive different index weights and therefore different ETF ownership.
- The paper uses bandwidths from 100 to 500 stocks around the cutoff.
- It focuses on the pre-banding-rule period when the cutoff assignment was cleaner.

Interpretation. This design moves the analysis closer to causal inference by using externally generated variation in ETF ownership.

4.3 Threats to exclusion and how the paper responds

- **Visibility/information production.** Switching indexes might change analyst coverage or media attention. Prior evidence and the paper's reversal tests make this less likely as the full explanation.
- **Other institutional ownership.** Index, active, and hedge fund ownership may also move around the Russell cutoff. The paper controls for them and tests ratios of ETF ownership to other ownership types.
- **Time-varying ETF importance.** The instrument should be stronger when aggregate ETF ownership is higher. Table V Panel C supports this implication.
- **Local nature.** IV magnitudes apply to stocks near the Russell cutoff and may not generalize to all stocks.

Interpretation. The paper's causal case is strongest when the evidence is viewed as a bundle: OLS, Russell IV, return reversals, variance ratios, and arbitrage-cost interactions all point in the same direction.

4.4 What the paper cannot fully prove

- The Russell design identifies a local treatment effect, not necessarily a universal market-wide effect.
- ETF flows and arbitrage are measured with proxies; actual AP inventory and all arbitrage trades are not directly observed.
- Return reversals support a nonfundamental interpretation, but price discovery and liquidity trading can coexist.
- The expected-return premium may reflect ETF-induced risk, but asset-pricing tests cannot fully rule out every omitted risk characteristic.

Interpretation. The paper is strongest on the claim that ETF ownership is associated with, and plausibly causes, higher volatility; the exact decomposition between noise, information, and risk premia is harder.

5 Tables and figures

5.1 Table I: ETF ownership statistics

Read:

- ETF ownership rises dramatically from 2000 to 2015.
- In S&P 500 stocks, ETF ownership increases from 0.14% of market capitalization in 2000 to 7.05% in 2015.
- In Russell 3000 stocks, ETF ownership rises from 0.14% to 7.48%.
- ETF ownership grows much faster than index mutual fund ownership.

Economic message. ETF ownership becomes economically important during the sample, creating the conditions for ETFs to transmit demand shocks to stocks.

Table I
ETF Ownership Statistics

The table presents descriptive statistics for stock ownership by ETFs, index mutual funds, and active mutual funds for the S&P 500 and Russell 3000 universes. For each year, across months and stocks, we average the number of institutions and the percentage of each stock owned by an institution type. We also report cumulative assets owned by these institutions in the stocks in our sample, as reported in Thomson-Reuters Mutual Fund Ownership data.

	S&P 500								
	ETFs			Index Funds			Active Funds		
Year	Number of Funds	Percentage of Market Cap	Market Cap (in Dollars)	Number of Funds	Percentage of Market Cap	Market Cap (in Dollars)	Number of Funds	Percentage of Market Cap	Market Cap (in Dollars)
2000	4.5	0.14%	$16.6	111.6	2.61%	$318.6	240.5	15.22%	$1,872.1
2001	12.6	0.18%	$18.0	126.7	2.65%	$269.7	277.8	15.65%	$1,616.9
2002	14.2	0.46%	$39.6	137.6	2.76%	$239.9	288.4	16.07%	$1,416.2
2003	15.1	0.69%	$62.4	141.7	2.92%	$262.9	286.0	16.16%	$1,471.9
2004	18.4	0.86%	$90.6	142.4	3.23%	$341.2	284.3	16.83%	$1,804.4
2005	20.2	1.16%	$129.5	139.3	3.44%	$383.8	287.6	17.55%	$1,980.4
2006	21.5	1.29%	$157.2	130.4	3.64%	$444.4	281.2	18.10%	$2,231.2
2007	38.5	2.50%	$336.2	128.6	3.04%	$407.8	307.5	19.66%	$2,638.5
2008	54.2	4.18%	$430.6	131.1	2.28%	$237.5	345.2	21.18%	$2,214.3
2009	56.0	4.66%	$412.1	125.8	2.51%	$223.0	357.2	21.56%	$1,913.9
2010	54.7	4.77%	$506.6	113.7	2.60%	$275.9	357.2	21.44%	$2,281.3
2011	54.9	5.21%	$604.6	108.6	2.61%	$303.2	326.6	21.72%	$2,527.8
2012	51.5	5.58%	$717.6	99.9	2.73%	$351.2	299.8	20.90%	$2,695.8
2013	53.4	6.30%	8958.0	97.0	2.87%	$437.2	284.5	21.41%	$3,265.6
2014	47.7	6.47%	$1,140.7	91.7	2.90%	$512.0	260.1	20.96%	$3,697.0
2015	48.3	7.05%	$1,214.2	92.9	3.20%	$550.9	257.3	21.70%	$3,741.8

(Continued)

(a) S&P 500 ETF ownership

Table I—*Continued*

	Russell 3000								
	ETFs			Index Funds			Active Funds		
Year	Number of Funds	Percentage of Market Cap	Market Cap (in Dollars)	Number of Funds	Percentage of Market Cap	Market Cap (in Dollars)	Number of Funds	Percentage of Market Cap	Market Cap (in Dollars)
2000	2.2	0.12%	$17.5	40.4	2.33%	$343.1	80.3	16.44%	$2,456.3
2001	7.5	0.19%	$23.3	46.6	2.49%	$298.7	92.7	16.59%	$2,006.3
2002	8.1	0.48%	$48.9	51.5	2.65%	$276.5	97.4	17.00%	$1,777.8
2003	8.7	0.73%	$80.6	56.3	2.83%	$310.4	98.4	17.11%	$1,882.0
2004	10.6	0.93%	$121.2	57.2	3.15%	$413.4	102.6	17.95%	$2,361.5
2005	11.5	1.24%	$173.2	56.2	3.38%	$473.3	105.5	18.74%	$2,637.3
2006	12.5	1.39%	$210.8	55.4	3.66%	$555.7	105.1	19.14%	$2,932.8
2007	22.4	2.65%	$445.4	55.3	3.09%	$518.2	124.8	21.02%	$3,563.3
2008	31.0	4.34%	$555.8	57.9	2.26%	$291.7	144.0	22.54%	$2,941.7
2009	31.2	4.95%	$534.2	58.5	2.51%	$271.3	147.9	23.07%	$2,498.0
2010	30.1	5.14%	$677.5	52.2	2.59%	$339.5	139.8	23.07%	$3,050.8
2011	30.0	5.56%	$803.4	51.4	2.61%	$375.5	134.2	23.28%	$3,382.7
2012	28.2	5.94%	$942.1	49.1	2.71%	$427.0	122.9	22.40%	$3,572.6
2013	29.7	6.70%	$1,267.7	47.9	2.86%	$537.2	119.2	22.93%	$4,370.6
2014	27.6	6.83%	$1,502.4	45.4	2.89%	$632.2	109.8	22.21%	$4,917.8
2015	28.3	7.48%	$1,611.3	44.6	3.14%	$673.6	109.4	22.92%	$4,974.1

(b) Russell 3000 ETF ownership

5.2 Table II: Summary statistics

Read:

- The paper reports stock-month variables, correlations, daily variables used in return regressions, and Ancerno trading variables.
- ETF ownership is small on average but highly dispersed, giving useful cross-sectional variation.
- ETF flows are scaled by stock trading volume, making the flow measure comparable across firms.
- Ancerno data allow the paper to measure institutional trading intensity and price impact directly.

Economic message. Table II defines the empirical objects used throughout the paper: ownership, volatility, flows, liquidity, and investor turnover.

Table II
Summary Statistics

The table presents summary statistics for the variables used in the study. Panel A reports summary statistics for the stock-month sample. Panel B reports correlations for the same sample, and Panel C reports summary statistics for the stock-day sample. Panel D reports summary statistics for the Ancerno transaction-level data. The samples cover the period January 2000 to December 2015.

Panel A: Monthly Sample

S&P 500

	N	Mean	*SD*	Min	Median	Max
Daily stock volatility (%)	81,243	2.010	1.400	0.581	1.600	11.000
Skewness	81,243	0.109	2.490	−8.900	0.114	8.900
Log(abs(VR 5 days/(5*1 day)))	81,243	−1.810	0.895	−3.850	−1.600	−0.582
ETF ownership	81,243	0.026	0.019	0.000	0.023	0.112
Index fund ownership	81,243	0.062	0.020	0.004	0.061	0.120
Active fund ownership	81,243	0.176	0.063	0.008	0.173	0.354
Hedge fund ownership	81,243	0.034	0.045	0.000	0.019	0.354
log(Mktcap ($m))	81,243	9.360	1.060	5.230	9.300	11.400
1/Price	81,243	0.039	0.040	0.004	0.029	0.556
Amihud ratio	81,243	0.000	0.001	0.000	0.000	0.036
Bid-ask spread (%)	81,243	0.207	0.462	0.000	0.048	3.700
Book-to-market	81,243	0.524	0.385	0.038	0.420	2.360
Past 12-month returns	81,243	0.113	0.366	−0.823	0.100	2.180
Gross profitability	81,243	0.301	0.224	−0.399	0.262	1.120

(Continued)

(a) Panel A summary statistics, part 1

Table II—*Continued*

Panel A: Monthly Sample

Russell 3000

	N	Mean	*SD*	Min	Median	Max
Daily stock volatility (%)	418,748	2.610	1.760	0.581	2.120	11.000
Skewness	418,745	0.123	2.490	−8.900	0.130	8.900
Log(abs(VR 5 days/(5*1 day)))	418,748	−1.740	0.902	−3.850	−1.520	−0.582
ETF ownership	418,748	0.028	0.023	0.000	0.023	0.112
Index fund ownership	418,748	0.047	0.025	0.002	0.045	0.120
Active fund ownership	418,748	0.151	0.083	0.002	0.149	0.354
Hedge fund ownership	418,748	0.058	0.070	0.000	0.031	0.354
log(Mktcap ($m))	418,748	7.120	1.540	4.250	6.900	11.400
1/Price	418,748	0.073	0.083	0.004	0.047	0.556
Amihud ratio	418,748	0.015	0.037	0.000	0.002	0.278
Bid-ask spread (%)	418,748	0.293	0.527	0.000	0.113	3.700
Book-to-market	418,748	0.588	0.414	0.038	0.498	2.360
Past 12-month returns	418,748	0.133	0.485	−0.823	0.089	2.180
Gross profitability	418,748	0.293	0.258	−0.399	0.262	1.120

(Continued)

(b) Panel A summary statistics, part 2

Table II—*Continued*

Panel B: Correlations

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Daily stock volatility (%)	(1)	1.000												
Skewness	(2)	−0.004	1.000											
Log(abs(VR 5 days/(5*1 day)))	(3)	0.027	0.000	1.000										
ETF ownership (%)	(4)	−0.074	−0.021	−0.022	1.000									
Index fund ownership (%)	(5)	−0.092	−0.007	−0.060	0.355	1.000								
Active fund ownership (%)	(6)	−0.102	−0.004	−0.097	0.160	0.428	1.000							
Hedge fund ownership (%)	(7)	0.071	0.008	−0.025	0.055	−0.005	−0.052	1.000						
log(Mktcap ($m))	(8)	−0.343	−0.001	−0.083	0.041	0.325	0.382	−0.147	1.000					
1/Price	(9)	0.402	0.001	0.040	−0.074	−0.169	−0.287	0.094	−0.459	1.000				
Amihud ratio	(10)	0.312	−0.003	0.104	−0.174	−0.262	−0.377	−0.035	−0.473	0.439	1.000			
Bid-ask spread (%)	(11)	0.273	0.000	0.058	−0.270	−0.212	−0.222	−0.084	−0.265	0.281	0.428	1.000		
Book-to-market	(12)	0.104	0.001	0.036	0.088	0.089	−0.164	−0.010	−0.227	0.234	0.190	0.132	1.000	
Past 12-month returns	(13)	−0.191	−0.007	−0.031	−0.009	−0.015	0.024	0.028	0.134	−0.240	−0.187	−0.147	−0.264	1.000
Gross profitability	(14)	−0.029	0.001	−0.030	−0.015	0.025	0.201	0.010	0.033	−0.061	−0.082	−0.054	−0.297	0.083

(Continued)

(a) Panel B correlations

Table II—*Continued*

Panel C: Variables Used in Return Regressions (Daily Frequency)

S&P 500

	N	Mean	*SD*	Min	Median	Max
Net flows ($ million)	1,501,051	0.250	40.700	−12.400	0.027	13.200
abs(Net flows) ($ million)	1,501,051	2.050	40.700	0.000	0.609	18.300
Net flows/Daily volume	1,501,056	0.002	0.027	−0.081	0.001	0.088
abs(Net flows/Daily volume	1,501,056	0.015	0.022	0.000	0.007	0.111
NBBO size ($)	1,437,745	517	1813	54	295	3433
DGTW Ret[t] (%)	1,501,056	0.015	1.700	−4.820	−0.013	5.150
DGTW Ret[$t, t+4$] (%)	1,501,056	0.070	3.660	−10.000	−0.004	10.800
DGTW Ret[$t, t+9$] (%)	1,501,056	0.127	5.070	−13.500	0.018	14.700
DGTW Ret[$t, t+19$] (%)	1,501,056	0.209	7.090	−18.400	0.061	20.200
DGTW Ret[$t, t+39$] (%)	1,501,056	0.352	10.000	−25.400	0.136	28.500
abs(Net flows)$\times 10^6$/Mkt cap	1,542,880	0.012	0.016	0.000	0.006	0.078
sum(abs(Flows))$\times 10^6$/Mkt cap	1,542,880	0.018	0.020	0.000	0.012	0.096
Intraday price range (%)	1,542,880	0.028	0.021	0.006	0.022	0.111
Intraday volatility (%)	1,542,880	0.020	0.018	0.005	0.014	0.100
abs(Mispricing) (bps)	1,686,822	0.174	0.147	0.013	0.129	0.859
Net(mispricing) (bps)	1,660,396	−0.004	0.125	−0.499	0.006	0.369
Share lending fee (%)	1,029,618	0.213	1.110	0.000	0.099	72.400

(Continued)

(b) Panel C daily variables

Table II—*Continued*

Panel C: Variables Used in Return Regressions (Daily Frequency)

Russell 3000

	N	Mean	*SD*	Min	Median	Max
Net flows ($ million)	7,812,071	0.081	23.300	−4.600	0.000	5.130
abs(Net flows) ($ million)	7,812,071	0.617	23.300	0.000	0.091	7.770
Net flows/Daily volume	7,812,107	0.002	0.051	−0.166	0.000	0.176
abs(Net flows)/Daily volume	7,812,107	0.029	0.042	0.000	0.011	0.197
NBBO size ($)	7,733,982	226	1,057	16	100	1,886
DGTW Ret[t] (%)	7,812,107	0.007	2.070	−5.750	−0.038	6.360
DGTW Ret[$t, t+4$] (%)	7,812,107	0.021	4.410	−11.800	−0.095	13.000
DGTW Ret[$t, t+9$] (%)	7,812,107	0.026	6.090	−15.800	−0.138	17.400
DGTW Ret[$t, t+19$] (%)	7,812,107	0.021	8.540	−21.600	−0.206	23.800
DGTW Ret[$t, t+39$] (%)	7,812,107	0.007	12.100	−29.900	−0.359	33.900
abs(Net flows)$\times 10^6$/Mkt cap	8,546,816	0.017	0.022	0.000	0.008	0.094
sum(abs(Flows))$\times 10^6$/Mkt cap	8,546,816	0.022	0.026	0.000	0.013	0.108
Intraday price range (%)	8,546,297	0.036	0.028	0.006	0.028	0.143
Intraday volatility (%)	8,546,816	0.024	0.019	0.005	0.018	0.102
abs(Mispricing) (bps)	8,572,503	0.211	0.169	0.013	0.162	0.859
Net(mispricing) (bps)	8,454,831	−0.015	0.153	−0.499	−0.001	0.369
Share lending fee (%)	4,554,404	0.444	2.240	0.000	0.132	132.000

Panel D: Ancerno Data

S&P 500

	N	Mean	*SD*	Min	Median	Max
Price impact (bps)	28,291,346	3.757	98.373	−463.063	1.242	489.987
Turnover (%)	28,291,346	0.446	1.689	0.000	0.031	24.758

Russell 3000

Price impact (bps)	54,250,928	5.355	114.126	−463.063	1.685	489.987
Turnover (%)	54,250,928	0.939	2.676	0.000	0.077	24.758

5.3 Figures 1 and 2: Two mechanisms for ETF effects

Read:

- Figure 1 illustrates the liquidity-trading mechanism: a demand shock moves the ETF price, arbitrageurs trade the underlying basket, and the stock prices temporarily inherit the shock.

- Figure 2 illustrates the price-discovery mechanism: a fundamental shock is incorporated into ETF prices first, and underlying stocks catch up later.
- The two hypotheses can both produce higher volatility, but they differ in return reversals.

Economic message. The key empirical question is not whether ETF ownership raises volatility alone, but whether that volatility reflects noise or faster information aggregation.

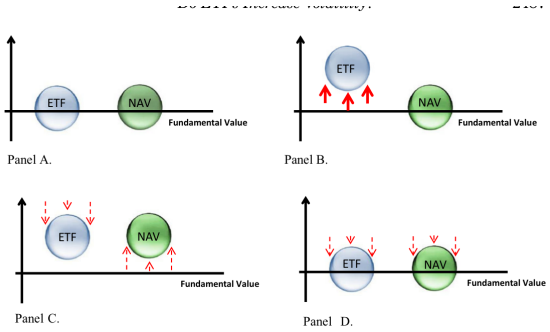

Figure 1. Illustration of the propagation of liquidity shocks via arbitrage. (Panel A) Initial equilibrium. (Panel B) Liquidity shock to ETF. (Panel C) Initial outcome of arbitrage: the shock is propagated to the NAV, and the ETF price starts reverting to the fundamental value. (Panel D) Equilibrium reestablished: after some time, both the ETF price and the NAV revert to the fundamental value. (Color figure can be viewed at wileyonlinelibrary.com)

in Figure 1, Panel C). Thus, ETFs can propagate mispricing to the underlying securities not only because they are traded directly by uninformed investors.

(a) Liquidity-shock propagation

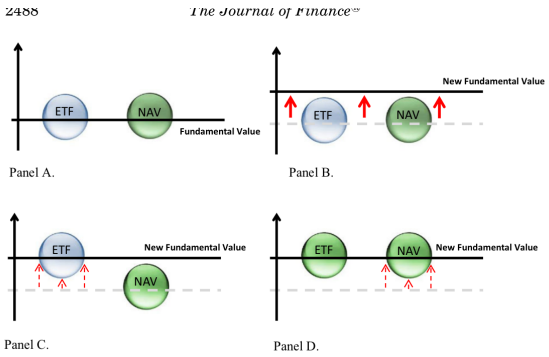

Figure 2. Illustration of the propagation of a fundamental shock with price discovery occurring in the ETF market. (Panel A) Initial equilibrium. (Panel B) Shock to fundamental value. (Panel C) Price discovery takes place in the ETF market. The ETF price moves to the new fundamental value. (Panel D) After a delay, the NAV catches up with the new fundamental. (Color figure can be viewed at wileyonlinelibrary.com)

(b) Price-discovery propagation

5.4 Table III: ETFs are more liquid and attract high-turnover investors

Read:

- ETF bid-ask spreads and Amihud price impact are lower than those of the underlying stocks.
- ETF turnover is much higher than stock turnover.
- Institutional churn ratios are higher for ETF holdings than for stock holdings across institution types.
- Ancerno regressions show that a security being an ETF raises raw and adjusted churn ratios substantially.

Economic message. The clientele premise is supported: ETFs attract short-horizon traders, making them plausible conduits for high-frequency liquidity shocks.

Table III

ETFs versus Stocks: Liquidity, Institutional Ownership, Churn Ratio

The table reports statistics for ETF- and stock-level liquidity, investor turnover, and ownership. The sample includes S&P 500 stocks and ETFs. Panel A reports the security-level liquidity measures (bid-ask spread, the Amihud (2002) ratio, and daily turnover). For all ETFs in our sample, we compute the average measure of liquidity across the stocks in the basket in a given quarter. We then value-weight the ETF- and basket-level measures across all ETFs at the quarter level using ETF market capitalization. Panel B presents information about institutional ownership averaged across all 64 quarters, in the first quarter of the sample, and in the last quarter of the sample. Ownership averages are presented for the ETFs in our sample and all of the stocks in the CRSP data set. Churn ratio is computed as the sum of quarterly absolute changes in dollar holdings over average AUM. Panel C uses trade-level data from Ancerno, aggregated at the manager-stock-quarter level to present regressions of the churn ratio and adjusted churn ratio on an ETF indicator. Summary statistics for Panel C are presented in Table IA.III in the Internet Appendix. t-statistics for the test of the null hypothesis that the difference is equal to zero are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample covers the period Q1:2000 to Q4:2015.

Panel A: Liquidity and Investors' Churn Ratio Measures

Liquidity Measures	Quarters	ETFs	Stocks	Difference	t-Statistics
Bid-ask spread	64	0.002	0.004	−0.002	(−3.611)
Amihud ratio	64	0.002	0.007	−0.004	(−7.408)
Daily turnover	64	0.085	0.010	0.075	−13.682

Panel B: Types of Institutional Ownership

	Common Stocks				ETFs			
	Ownership				Ownership			
Type of Institution	Total	Q1:2000	Q4:2015	Churn Ratio	Average	Q1:2000	Q4:2015	Churn Ratio
Bank and trust	1.7%	1.5%	1.9%	17.9%	3.3%	2.5%	4.8%	31.2%
Insurance company	0.8%	0.8%	0.9%	11.3%	0.5%	1.1%	0.4%	37.6%
Investment advisor/investment company	38.9%	32.6%	43.0%	18.5%	16.1%	14.2%	25.2%	45.1%
Investment advisor/hedge fund	14.7%	11.0%	15.6%	26.7%	8.7%	13.7%	6.3%	48.5%
Hedge fund	2.8%	0.9%	4.2%	74.8%	1.9%	1.0%	0.7%	100.8%
Pension fund	3.7%	2.7%	3.4%	13.3%	1.4%	1.6%	1.1%	58.5%
Research firm	2.0%	0.8%	2.9%	39.7%	17.6%	7.4%	17.6%	51.0%
Other institutions	0.7%	0.4%	0.7%	23.7%	1.3%	0.8%	0.1%	62.7%
All institutions	65.4%	50.9%	72.4%	22.6%	50.7%	42.2%	56.3%	47.8%

Panel C: Churn Ratio Regressions

Dependent Variable:	Churn Ratio			Adjusted Churn Ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
Security is ETF	0.194***	0.197***	0.146***	0.571***	0.570***	0.372***
	(13.764)	(14.584)	(11.060)	(10.258)	(10.142)	(7.246)
Date fixed effects	No	Yes	Yes	No	Yes	Yes
Manager fixed effects	No	No	Yes	No	No	Yes
Observations	32,371	32,371	32,329	32,371	32,371	32,329
Adjusted-R^2	0.154	0.168	0.358	0.098	0.101	0.396

5.5 Table IV and Figure 3: OLS volatility and Russell cutoff

Read:

- Table IV shows that ETF ownership is positively related to stock volatility in OLS.
- In the S&P 500, a one-standard-deviation increase in ETF ownership is associated with about 0.164 standard deviations higher daily volatility in the baseline specification.
- The coefficient remains positive after adding other institutional ownership and lagged volatility.
- Figure 3 shows the discontinuity in ETF ownership around the Russell cutoff; stocks moving into the Russell 2000 receive higher ETF ownership.

Economic message. OLS gives the broad correlation; the Russell cutoff motivates the IV strategy by showing an exogenous-looking jump in ETF ownership.

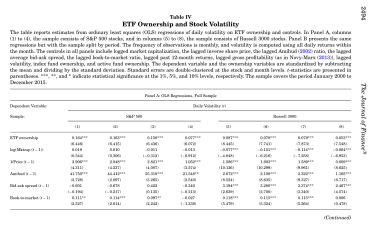

Table IV

ETF Ownership and Stock Volatility

The table reports estimates from ordinary least squares (OLS) regressions of daily volatility on ETF ownership and controls. In Panel A, columns (1) to (4), the sample consists of S&P 500 stocks, and in columns (5) to (8), the sample consists of Russell 3000 stocks. Panel B presents the same specification for Russell 1000 and Russell 2000 stocks. The dependent variable is daily volatility (computed using daily returns within a month). The explanatory variable is the month. The controls in all panels include lagged market capitalization, the lagged inverse share price, the lagged Amihud (2002) ratio, the lagged average bid-ask spread, the lagged book-to-market ratio, lagged past 12-month returns, lagged gross profitability (as in Novy-Marx (2013)), lagged volatility, index fund ownership, and active fund ownership. The dependent variable and the ownership variables are standardized by subtracting the mean and dividing by the standard deviation. Standard errors are double-clustered at the stock and month levels. t-statistics are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample covers the period January 2000 to December 2015.

Panel A: OLS Regressions, Full Sample

Dependent Variable:	Daily Volatility (t)							
Sample:	S&P 500				Russell 3000			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ETF ownership	0.162***	0.303***	0.138***	0.077***	0.607***	0.578***	0.078***	0.055***
	(4.174)	(5.701)	(6.544)	(7.063)	(9.392)	(8.390)	(4.892)	(4.890)
$\log(\text{Mktcap})$ $(t-1)$	0.418	0.431	−0.01	0.013	0.477***	0.141***	0.114***	−0.064***
	(0.544)	(0.595)	(−0.553)	(−0.913)	(−4.640)	(−6.616)	(−7.508)	(−6.803)
$1/\text{Price}$ $(t-1)$	2.926***	2.640***	3.957***	1.052***	1.390***	1.663***	1.508***	0.660***
	(4.314)	(4.227)	(4.087)	(3.374)	(13.146)	(10.288)	(9.963)	(9.633)
Amihud $(t-1)$	41.759***	44.410***	35.338***	21.043***	2.872***	3.180***	3.522***	1.165***
	(3.726)	(3.897)	(3.262)	(2.543)	(9.334)	(9.033)	(9.247)	(5.717)
Bid-ask spread $(t-1)$	0.164	0.164	0.164	0.164	0.164***	0.164***	0.164***	0.164***
	(−0.104)	(−0.417)	(0.135)	(−0.413)	(3.639)	(3.790)	(3.548)	(4.574)
Book-to-market $(t-1)$	0.111**	0.114***	0.087**	−0.027	0.110***	0.113***	0.115***	−0.006
	(2.527)	(2.614)	(2.242)	(−1.558)	(5.479)	(5.584)	(5.264)	(−0.476)

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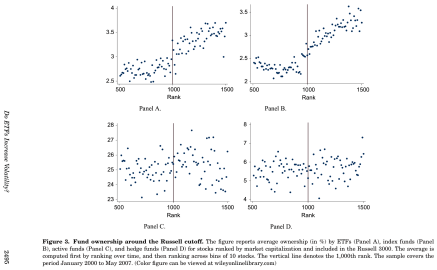

Table IV—*Continued*

Panel A: OLS Regressions, Full Sample

Dependent Variable:	Daily Volatility (t)							
Sample:	S&P 500				Russell 3000			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Past 12-month returns $(t-1)$	−0.070**	−0.050**	−0.120***	−0.066	0.012	0.024	0.013	0.013
	(−2.200)	(−2.408)	(−2.216)	(−0.487)	(0.701)	(1.452)	(0.926)	(1.167)
Gross profitability $(t-1)$	0.010	0.030	0.018	−0.043	−0.141***	−0.15***	−0.138***	−0.085***
	(0.660)	(1.624)	(0.913)	(−1.342)	(−5.627)	(−6.14)	(−5.606)	(−5.893)
Index fund ownership $(t-1)$		0.014	0.015	0.002		0.058***	0.057***	0.060***
		(1.241)	(1.447)	(0.451)		(0.036)	(0.157)	(3.022)
Active fund ownership $(t-1)$		0.040***	0.040***	0.030***		0.040***	0.040***	0.020***
		(3.594)	(3.515)	(2.264)		(6.574)	(6.660)	(5.945)
Hedge fund ownership $(t-1)$		−0.013	−0.013	−0.026***		−0.027***	−0.025***	−0.023***
		(−1.006)	(−0.990)	(−4.235)		(−3.596)	(−3.282)	(−7.995)
Volatility $(t-1)$				0.175***				0.175***
				(17.597)				(29.392)
Volatility $(t-2)$				0.176***				0.164***
				(9.600)				(22.764)
Volatility $(t-3)$				0.284***				0.177***
				(14.983)				(28.981)
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	91,246	91,245	75,015	71,373	415,746	416,746	392,094	392,094
R^2	0.641	0.644	0.664	0.746	0.607	0.608	0.613	0.670

(Continued)

Figure 3. Fund ownership around the Russell cutoff. The figure reports average ownership (in %) by ETFs (Panel A), index funds (Panel B), active funds (Panel C), and hedge funds (Panel D) for stocks ranked by market capitalization and included in the Russell 3000. The average is computed first by ranking over time, and then ranking across bins of 10 stocks. The vertical line denotes the 1,000th rank. The sample covers the period January 2000 to May 2007. (Color figure can be viewed at wileyonlinelibrary.com)

(a) Table IV, part 1

(b) Table IV, part 2

(c) Figure 3: Russell cutoff

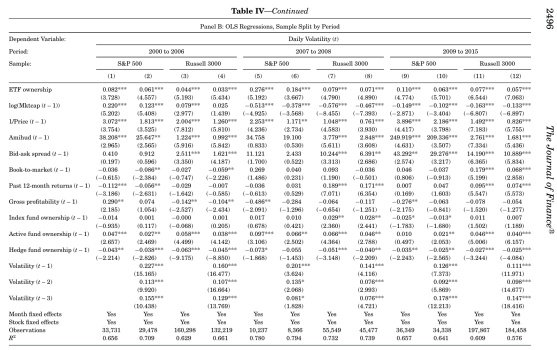

Table IV—*Continued*

Panel B: OLS Regressions, Sample Split by Period

Dependent Variable:	Daily Volatility (t)											
Period:	2000 to 2006				2007 to 2008				2009 to 2015			
Sample:	S&P 500		Russell 3000		S&P 500		Russell 3000		S&P 500		Russell 3000	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ETF ownership	0.082***	0.061***	0.044***	0.032***	0.278***	0.184***	0.079***	0.071***	0.135***	0.062***	0.072***	0.057***
	(3.728)	(4.557)	(5.193)	(5.434)	(5.192)	(3.667)	(4.790)	(4.890)	(4.774)	(5.701)	(6.544)	(7.063)
$\log(\text{Mktcap})$ $(t-1)$	0.220***	0.123***	0.079***	0.025	−0.513***	−0.378***	−0.576***	−0.467***	−0.149***	−0.102***	−0.163***	−0.132***
	(5.202)	(5.408)	(2.977)	(1.439)	(−4.925)	(−3.588)	(−8.455)	(−7.283)	(−2.571)	(−3.404)	(−6.807)	(−6.897)
$1/\text{Price}$ $(t-1)$	3.072***	1.813***	2.004***	1.260***	2.253***	1.171**	1.048***	0.761***	3.886***	2.186***	1.492***	0.926***
	(3.754)	(3.525)	(7.812)	(5.819)	(4.236)	(2.734)	(4.583)	(3.930)	(4.417)	(3.798)	(7.183)	(5.735)
Amihud $(t-1)$	38.208***	25.647**	1.224***	0.989***	34.758	19.100	3.779***	2.848***	249.919***	209.336***	2.761***	1.681***
	(2.965)	(2.565)	(5.916)	(5.842)	(0.833)	(0.530)	(5.611)	(3.608)	(4.631)	(3.507)	(7.334)	(5.436)
Bid-ask spread $(t-1)$	0.410	0.912	2.511***	1.621***	11.121	2.433	10.244***	6.391**	43.292**	29.276***	14.190***	10.889***
	(0.197)	(0.596)	(3.350)	(4.187)	(1.700)	(0.522)	(3.313)	(2.686)	(2.574)	(3.217)	(6.365)	(5.834)
Book-to-market $(t-1)$	−0.038	−0.088**	−0.027	−0.059**	0.269	0.040	0.093	−0.036	0.048	−0.057	0.179***	0.068***
	(−0.615)	(−2.384)	(−0.747)	(−2.226)	(1.486)	(0.231)	(1.190)	(−0.501)	(0.806)	(−0.913)	(5.199)	(2.858)
Past 12-month returns $(t-1)$	−0.112***	−0.056**	−0.029	−0.007	−0.038	0.031	0.189***	0.171***	0.007	0.047	0.095***	0.074***
	(−3.186)	(−2.631)	(−1.642)	(−0.585)	(−0.613)	(0.529)	(7.071)	(6.354)	(0.169)	(1.603)	(5.547)	(5.573)
Gross profitability $(t-1)$	0.290**	0.074	−0.142**	−0.104**	−0.486**	−0.284	−0.064	−0.117	−0.276**	−0.063	−0.078	−0.054
	(2.185)	(1.054)	(−2.527)	(−2.434)	(−2.091)	(−1.298)	(−0.654)	(−1.251)	(−2.175)	(−0.841)	(−1.520)	(−1.277)
Index fund ownership $(t-1)$	−0.014	0.001	−0.000	0.001	0.017	0.010	0.029**	0.026**	−0.025*	−0.013*	0.011	0.007
	(−0.935)	(0.117)	(−0.066)	(0.205)	(0.676)	(0.421)	(2.360)	(2.441)	(−1.783)	(−1.680)	(1.502)	(1.189)
Active fund ownership $(t-1)$	0.047***	0.027**	0.058***	0.038***	0.097***	0.066**	0.060***	0.046**	0.010	0.021**	0.046***	0.040***
	(2.657)	(2.469)	(4.499)	(4.142)	(3.106)	(2.562)	(4.364)	(2.788)	(0.497)	(2.053)	(5.006)	(6.157)
Hedge fund ownership $(t-1)$	−0.043**	−0.038***	−0.063***	−0.045***	−0.073*	−0.055	−0.051***	−0.040**	−0.035**	−0.025**	−0.027***	−0.025***
	(−2.214)	(−2.826)	(−9.175)	(−8.959)	(−1.868)	(−1.453)	(−3.148)	(−2.209)	(−2.243)	(−2.565)	(−3.244)	(−4.084)
Volatility $(t-1)$		0.227***		0.160***		0.201***		0.141***		0.126***		0.111***
		(15.165)		(16.477)		(3.624)		(4.116)		(7.373)		(11.971)
Volatility $(t-2)$		0.113***		0.107***		0.135*		0.076***		0.092***		0.098***
		(9.920)		(16.664)		(2.068)		(2.993)		(5.869)		(14.677)
Volatility $(t-3)$		0.155***		0.128***		0.081*		0.076***		0.179***		0.147***
		(10.438)		(13.769)		(1.828)		(4.731)		(12.313)		(18.416)
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,731	29,478	160,298	131,219	10,277	8,366	55,549	45,477	36,549	34,338	197,867	184,458
R^2	0.656	0.709	0.629	0.661	0.780	0.794	0.732	0.739	0.657	0.641	0.659	0.576

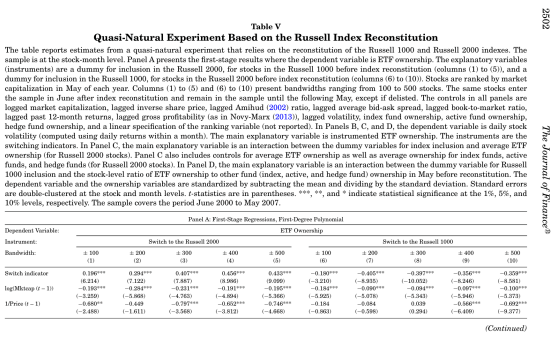

Table V

Quasi-Natural Experiment Based on the Russell Index Reconstitution

The table reports estimates from a quasi-natural experiment that relies on the reconstitution of the Russell 1000 and Russell 2000 indexes. The sample is at the stock-month level. Panel A presents the first-stage results where the dependent variable is ETF ownership. The explanatory variables (instruments) are a dummy for inclusion in the Russell 2000, for stocks in the Russell 1000 before index reconstitution (columns (1) to (5)), and a dummy for inclusion in the Russell 1000, for stocks in the Russell 2000 before index reconstitution (columns (6) to (10)). Stocks are ranked by market capitalization in May of each year. Columns (1) to (5) and (6) to (10) present bandwidths ranging from 100 to 500 stocks. The same stocks enter the sample in June after index reconstitution and remain in the sample until the following May, except if delisted. The controls in all panels are logged market capitalization, lagged inverse share price, lagged Amihud (2002) ratio, lagged average bid-ask spread, lagged book-to-market ratio, lagged past 12-month returns, lagged gross profitability (as in Novy-Marx (2013)), lagged volatility, index fund ownership, active fund ownership, hedge fund ownership, and a linear specification of the ranking variable (not reported). In Panels B, C, and D, the dependent variable is daily stock volatility (computed using daily returns within a month). The main explanatory variable is instrumented ETF ownership. The instruments are the switching indicators. In Panel C, the main explanatory variable is an interaction between the dummy variables for index inclusion and average ETF ownership (for Russell 2000 stocks). Panel C also includes controls for average ETF ownership as well as average ownership for index funds, active funds, and hedge funds (for Russell 2000 stocks). In Panel D, the main explanatory variable is an interaction between the dummy variable for Russell 1000 inclusion and the stock-level ratio of ETF ownership to other fund (index, active, and hedge fund) ownership in May before reconstitution. The dependent variable and the ownership variables are standardized by subtracting the mean and dividing by the standard deviation. Standard errors are double-clustered at the stock and month levels. t-statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample covers the period June 2000 to May 2007.

Panel A: First-Stage Regressions, First-Degree Polynomial

Dependent Variable:	ETF Ownership									
Instrument:	Switch to the Russell 2000					Switch to the Russell 1000				
Bandwidth:	± 100	± 200	± 300	± 400	± 500	± 100	± 200	± 300	± 400	± 500
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Switch indicator	0.196***	0.294***	0.407***	0.456***	0.433***	−0.190***	−0.405***	−0.297***	−0.356***	−0.259***
	(6.214)	(7.122)	(7.857)	(6.986)	(9.899)	(−3.210)	(−8.935)	(−10.052)	(−8.246)	(−8.581)
$\log(\text{Mktcap})$ $(t-1)$	−0.192***	−0.284***	−0.231***	−0.191***	−0.195***	−0.184***	−0.090***	−0.084***	−0.097***	−0.100***
	(−3.259)	(−5.868)	(−4.765)	(−4.694)	(−5.346)	(−5.923)	(−5.078)	(−5.343)	(−5.946)	(−5.373)
$1/\text{Price}$ $(t-1)$	−0.680**	−0.449	−0.797***	−0.652***	−0.746***	−0.184	−0.084	0.039	−0.566***	−0.092***
	(−2.486)	(−1.611)	(−5.566)	(−3.812)	(−4.668)	(−0.862)	(−0.598)	(0.294)	(−6.409)	(−9.277)

(Continued)

(a) Table IV, sample split

(b) Table V first stage

5.6 Table V: Russell reconstitution IV

Read:

- The first stage is strong: switching to the Russell 2000 raises ETF ownership, while switching to the Russell 1000 lowers it.
- The second stage finds positive effects of instrumented ETF ownership on volatility across bandwidths.
- The paper reports effects ranging from roughly 0.169 to 0.717 standard deviations, averaging about 0.31.
- Additional tests interact index switches with aggregate ETF ownership and with the ratio of ETF ownership to other institutional ownership.

Economic message. The IV evidence supports a causal interpretation: the ETF ownership component induced by index assignment raises stock volatility.

Table V—*Continued*

Panel A: First-Stage Regressions, First-Degree Polynomial

Dependent Variable:	ETF Ownership									
Instrument:	Switch to the Russell 2000					Switch to the Russell 1000				
Bandwidth:	± 100	± 200	± 300	± 400	± 500	± 100	± 200	± 300	± 400	± 500
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Amihud (t − 1)	−6.708***	−10.189***	−11.042***	−10.321***	−10.816***	−18.291***	−18.242***	−18.757***	−15.986***	−10.644***
	(−6.132)	(−8.164)	(−7.266)	(−7.238)	(−7.485)	(−11.623)	(−13.283)	(−11.000)	(−8.550)	(−9.445)
Bid-ask spread (t − 1)	−2.787	−1.098	−0.755	−2.438**	−4.318***	6.201***	3.892**	2.969***	3.989***	1.949**
	(−1.354)	(−1.088)	(−0.785)	(−2.383)	(−3.833)	(2.853)	(2.203)	(2.742)	(3.058)	(2.005)
Book-to-market (t − 1)	0.027	−0.008	0.023	0.022**	0.017**	0.283***	0.336***	0.318***	0.351***	0.253***
	(1.403)	(−0.416)	(1.628)	(2.029)	(2.000)	(7.261)	(13.789)	(18.003)	(19.998)	(19.685)
Past 12-month returns (t − 1)	0.045	0.039*	0.024	0.052**	0.016	−0.064***	−0.039*	−0.013	−0.017*	−0.017
	(1.264)	(1.868)	(1.171)	(2.386)	(0.758)	(−2.926)	(−1.963)	(−2.155)	(−1.400)	(−1.692)
Gross profitability (t − 1)	−0.160***	−0.171***	−0.162***	−0.178***	−0.128***	−0.101***	−0.101***	−0.042**	−0.007	−0.024
	(−4.142)	(−4.685)	(−5.130)	(−5.889)	(−3.965)	(−1.239)	(−3.836)	(−2.185)	(−0.430)	(−0.259)
Volatility (t − 1)	−0.054***	−0.042***	−0.033***	−0.028***	−0.027***	−0.133***	−0.124***	−0.123***	−0.121***	−0.124***
	(−4.816)	(−5.009)	(−4.144)	(−3.816)	(−3.280)	(−13.026)	(−16.633)	(−14.908)	(−15.266)	(−13.747)
Index fund ownership (t − 1)	0.116***	0.163***	0.165***	0.179***	0.197***	0.138***	0.159***	0.165***	0.163***	0.167***
	(12.537)	(16.642)	(15.637)	(19.056)	(20.545)	(7.903)	(6.666)	(9.682)	(10.202)	(10.653)
Active fund ownership (t − 1)	−0.066***	−0.049***	−0.022***	−0.011	−0.020***	0.095***	0.066***	0.057***	0.056***	0.068***
	(−8.811)	(−7.223)	(−3.230)	(−1.569)	(−3.066)	(5.916)	(6.050)	(8.366)	(8.646)	(10.713)
Hedge fund ownership (t − 1)	−0.118***	−0.105***	−0.102***	−0.100***	−0.104***	−0.093***	−0.106***	−0.080***	−0.070***	−0.072***
	(−11.806)	(−20.185)	(−25.145)	(−22.097)	(20.998)	(−9.275)	(−12.985)	(−16.223)	(−18.997)	(−21.934)
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,857	10,103	16,101	22,303	28,599	6,495	12,735	18,293	23,647	29,090

(*Continued*)

(a) Table V, first stage continued

Table V—*Continued*

Panel B: Second-Stage Regressions, First-Degree Polynomial

Dependent Variable:	Daily Volatility (σ)									
Instrument:	Switch to the Russell 2000					Switch to the Russell 1000				
Bandwidth:	± 100	± 200	± 300	± 400	± 500	± 100	± 200	± 300	± 400	± 500
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ETF ownership	0.512**	0.384***	0.269***	0.176**	0.249***	0.717**	0.249***	0.198***	0.222***	0.169***
	(2.224)	(2.640)	(3.269)	(2.631)	(3.656)	(2.409)	(3.572)	(3.252)	(3.486)	(3.284)
lagMktcap ($t-1$)	−0.346***	−0.404***	−0.479***	−0.512***	−0.533***	−0.600***	−0.731***	−0.706***	−0.761***	−0.726***
	(−3.995)	(−5.576)	(−7.079)	(−7.266)	(−7.222)	(−7.121)	(−9.075)	(−9.783)	(−9.504)	(−9.266)
1/Price ($t-1$)	2.758***	1.815***	1.559***	1.326***	1.461***	1.759***	1.395***	1.322***	1.411***	1.433***
	(5.928)	(6.649)	(6.570)	(6.651)	(9.395)	(6.464)	(6.511)	(8.198)	(8.382)	(9.383)
Amihud ($t-1$)	1.241	5.258**	4.982***	5.757***	6.139***	13.736**	6.568***	7.133***	7.248***	6.084***
	(0.493)	(2.413)	(2.876)	(3.501)	(3.845)	(2.251)	(3.293)	(5.038)	(6.163)	(7.969)
Bid-ask spread ($t-1$)	−0.484	0.696	1.293**	−2.833	−3.004	−12.446***	−3.365***	−5.741***	−8.158***	−10.448***
	(−0.165)	(0.319)	(−1.293)	(−1.654)	(−1.571)	(−3.084)	(−2.662)	(−3.349)	(−3.411)	(−3.641)
Book-to-market ($t-1$)	0.063*	0.062**	0.095***	0.088***	0.109***	−0.291***	−0.248***	−0.245***	−0.232***	−0.194***
	(2.115)	(3.117)	(4.458)	(4.276)	(5.189)	(−3.162)	(−4.827)	(−5.233)	(−5.206)	(−4.293)
Past 12-month returns ($t-1$)	−0.014	−0.029	0.027	0.008	0.038	0.309***	0.156***	0.152***	0.152***	0.140***
	(−0.277)	(−0.735)	(0.749)	(0.224)	(1.101)	(5.908)	(3.318)	(4.150)	(4.736)	(5.624)
Gross profitability ($t-1$)	0.004	0.049	0.066**	0.035	0.068***	0.173**	0.199***	0.080***	0.072***	0.033
	(0.051)	(1.084)	(2.167)	(1.305)	(2.852)	(2.421)	(5.443)	(3.176)	(3.339)	(1.500)
Volatility ($t-1$)	0.229***	0.263***	0.269***	0.267***	0.270***	0.376***	0.290***	0.287***	0.297***	0.294***
	(34.041)	(49.465)	(20.091)	(18.903)	(17.987)	(9.317)	(17.415)	(18.014)	(18.037)	(19.751)
Index fund ownership ($t-1$)	−0.002	−0.022	−0.013	0.001	−0.020	−0.059	−0.003	0.005	0.001	0.010
	(−0.074)	(−0.795)	(−0.807)	(0.073)	(−1.354)	(−1.461)	(−0.238)	(0.444)	(0.045)	(0.974)
Active fund ownership ($t-1$)	0.105***	0.083***	0.082***	0.088***	0.092***	0.024	0.093***	0.098***	0.092***	0.088***
	(3.878)	(5.866)	(9.452)	(9.880)	(11.365)	(0.957)	(10.297)	(12.991)	(12.686)	(12.378)
Hedge fund ownership ($t-1$)	0.088***	0.070***	0.054***	0.048***	0.050***	0.075**	0.012	0.011	0.011	0.011
	(2.776)	(4.236)	(5.291)	(5.997)	(6.117)	(2.308)	(1.061)	(1.228)	(1.332)	(1.487)
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,857	10,103	16,101	22,303	28,599	6,495	12,735	18,293	23,647	29,090

(*Continued*)

(b) Table V, second stage

Table V—*Continued*

Panel C: Identification from Time Series Variation in Aggregate Fund Ownership

Dependent Variable:	Daily Stock Volatility									
Instrument:	Switch to the Russell 2000					Switch to the Russell 1000				
Bandwidth:	± 100	± 200	± 300	± 400	± 500	± 100	± 200	± 300	± 400	± 500
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ETF ownership × Switch	0.231	0.401**	0.351**	0.219	0.216	−0.387*	−0.431***	−0.490***	−0.592***	−0.671***
	(1.289)	(2.450)	(2.430)	(1.574)	(1.390)	(−1.866)	(−2.849)	(−4.169)	(−4.068)	(−3.769)
Index funds ownership × Switch	−0.067***	−0.060**	−0.052**	−0.046**	−0.049**	0.067***	0.016	−0.011	−0.006	−0.008
	(−3.271)	(−2.493)	(−2.461)	(−2.248)	(−2.196)	(3.201)	(0.876)	(−0.707)	(−0.358)	(−0.399)
Active funds ownership × Switch	0.237***	0.041	0.046	0.053	0.056	−0.092	0.020	0.083	0.092	0.125*
	(5.136)	(0.657)	(0.783)	(0.856)	(0.935)	(−1.554)	(0.350)	(1.557)	(1.404)	(1.779)
Hedge funds ownership × Switch	0.176	0.079	−0.069	−0.041	−0.086	−0.121	−0.053	−0.093	−0.003	0.040
	(1.257)	(0.671)	(−0.556)	(−0.334)	(−0.758)	(−0.973)	(−0.710)	(−1.320)	(−0.033)	(0.483)
Switch indicator	11.776**	12.236***	7.772**	6.098*	4.730	−9.630***	−10.797***	−11.743***	−11.380***	−11.272***
	(2.448)	(3.404)	(2.431)	(1.943)	(1.262)	(−2.716)	(−4.342)	(−4.811)	(−4.108)	(−3.645)
lagMktcap ($t-1$)	−0.570***	−0.590***	−0.612***	−0.619***	−0.652***	−0.849***	−0.846***	−0.877***	−0.860***	−0.837***
	(−6.250)	(−8.189)	(−9.086)	(−9.657)	(−9.856)	(−9.943)	(−9.605)	(−11.168)	(−11.611)	(−11.912)
1/Price ($t-1$)	2.117***	1.640***	1.373***	1.252***	1.440***	1.649***	1.496***	1.374***	1.324***	1.358***
	(7.012)	(9.095)	(10.241)	(8.823)	(8.869)	(8.182)	(6.777)	(6.884)	(7.106)	(7.813)
Amihud ($t-1$)	−1.524	0.713	1.138	3.570**	3.223**	−1.118	0.228	2.469***	3.405***	4.304***
	(−0.897)	(0.518)	(1.282)	(2.566)	(2.508)	(−0.742)	(0.161)	(2.643)	(4.391)	(7.027)
Bid-ask spread ($t-1$)	−0.658	0.442	−1.969	−2.372	−5.742**	−8.066***	−9.079***	−8.493***	−8.282***	−10.094***
	(−0.203)	(0.242)	(−1.290)	(−1.384)	(−2.210)	(−2.775)	(−5.007)	(−3.538)	(−3.718)	(−3.976)
Book-to-market ($t-1$)	0.073**	0.081***	0.090***	0.091***	0.112***	−0.066	−0.171***	−0.198***	−0.150***	−0.115***
	(2.196)	(2.873)	(4.045)	(4.015)	(5.346)	(−1.144)	(−5.106)	(−3.684)	(−3.385)	(−2.759)
Past 12-month returns ($t-1$)	0.062	0.019	0.055	0.045	0.065*	0.274***	0.160***	0.161***	0.159***	0.166***
	(1.024)	(0.526)	(1.542)	(1.205)	(1.860)	(5.727)	(5.160)	(4.152)	(4.701)	(4.935)
Gross profitability ($t-1$)	−0.086*	−0.021	0.023	0.010	0.044**	0.117***	0.082***	0.072***	0.074***	0.049**
	(−1.748)	(−0.555)	(0.889)	(0.409)	(2.082)	(3.033)	(3.131)	(3.507)	(3.809)	(2.008)
Volatility ($t-1$)	2.214***	1.596***	1.339***	1.371***	1.255***	1.256**	1.217***	1.343***	1.243***	1.268***
	(4.114)	(3.663)	(4.186)	(4.542)	(4.535)	(2.458)	(3.244)	(3.377)	(3.393)	(3.966)
Index fund ownership ($t-1$)	0.783***	0.852***	0.992***	1.052***	1.068***	1.012***	1.367***	1.290***	1.256***	1.190***
	(5.733)	(7.957)	(10.225)	(10.143)	(11.400)	(6.437)	(11.668)	(13.062)	(13.154)	(13.254)
Active fund ownership ($t-1$)	0.676***	0.817***	0.612***	0.722***	0.606***	0.172	−0.173	0.040	0.071	0.144
	(3.490)	(6.219)	(5.629)	(6.892)	(6.488)	(1.031)	(−1.429)	(0.560)	(0.685)	(1.523)
Hedge fund ownership ($t-1$)	0.221***	0.247***	0.251***	0.262***	0.262***	0.275***	0.255***	0.261***	0.268***	0.271***
	(17.959)	(21.347)	(31.154)	(20.220)	(19.184)	(16.392)	(15.773)	(19.007)	(18.555)	(19.538)
Time trend, interacted with switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,858	10,107	16,107	22,315	28,615	6,499	12,744	18,304	23,663	29,077
R^2	0.634	0.669	0.604	0.594	0.594	0.495	0.473	0.476	0.484	0.488

(*Continued*)

(a) Table V, time-series interaction

Table V—*Continued*

Panel D: Ratio of ETF Ownership to Ownership by Other Fund Types

Dependent Variable:	Daily Stock Volatility														
Instrument:	Switch to the Russell 1000														
Ratio	ETF/Index Fund							ETF/Active Fund					ETF/Hedge Fund		
Bandwidth:	± 100	± 200	± 300	± 400	± 500	± 100	± 200	± 300	± 400	± 500	± 100	± 200	± 300	± 400	± 500
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Ratio × Switch	−0.033	−0.091**	−0.094**	−0.109***	−0.106***	−0.352	−0.268	−0.391**	−0.372***	−0.345***	−0.040***	−0.034***	−0.018**	−0.020***	−0.014*
	(−0.526)	(−2.443)	(−2.418)	(−3.025)	(−3.847)	(−1.465)	(−1.445)	(−2.553)	(−2.773)	(−2.857)	(−2.748)	(−3.251)	(−2.417)	(−2.674)	(−1.936)
Switch indicator	−0.083**	−0.042	−0.038	−0.022	−0.010	−0.089**	−0.064*	−0.052**	−0.035	−0.024	−0.061*	−0.067**	−0.078***	−0.059***	−0.048***
	(−2.159)	(−1.462)	(−1.580)	(−0.968)	(−0.500)	(−2.284)	(−1.955)	(−2.033)	(−1.547)	(−1.249)	(−1.891)	(−2.471)	(−3.567)	(−4.674)	(−2.925)
Ratio	−0.393***	−0.392***	−0.211***	−0.206***	−0.268***	−0.689***	−0.946***	−0.870***	−0.880***	−0.992***	−0.013	−0.020**	−0.029***	−0.029***	−0.036***
	(−3.397)	(−5.468)	(−7.513)	(−9.67)	(−9.866)	(−3.943)	(−8.656)	(−11.168)	(−11.611)	(−11.912)	(−1.658)	(−2.276)	(−3.904)	(−3.143)	(−4.674)
lagMktcap ($t-1$)	−0.597***	−0.577***	−0.590***	−0.587***	−0.553***	−0.587***	−0.567***	−0.567***	−0.531***	−0.526***	−0.608***	−0.583***	−0.585***	−0.549***	−0.555***
	(−8.022)	(−7.372)	(−8.936)	(−9.976)	(−8.976)	(−7.265)	(−7.386)	(−7.966)	(−7.257)	(−8.267)	(−8.463)	(−7.535)	(−8.470)	(−9.969)	(−9.151)
1/Price ($t-1$)	1.459***	1.599***	1.509***	1.395***	1.461***	1.797***	1.466***	1.458***	1.396***	1.505***	1.653***	1.779***	1.522***	1.224***	1.390***
	(6.483)	(9.247)	(11.075)	(10.267)	(12.839)	(7.141)	(5.305)	(6.607)	(6.958)	(9.953)	(6.952)	(10.696)	(12.255)	(9.977)	(11.778)
Amihud ($t-1$)	−1.319***	−1.862***	−1.974***	−1.479***	−0.584	−1.850	0.967	−0.488	−0.483	0.617	−3.619**	−4.409***	−3.540***	−2.623**	1.087
	(−2.704)	(−4.649)	(−4.139)	(−3.790)	(−1.377)	(−0.852)	(0.661)	(−0.451)	(−0.731)	(0.954)	(−2.083)	(−3.219)	(−2.969)	(−2.303)	(1.347)
Bid-ask spread ($t-1$)	1.040	1.791	0.164	0.040	−0.678	1.334	0.337	−0.561	0.336	−1.138	−0.650	−0.619	−2.713	−2.653	−3.977***
	(0.416)	(0.724)	(0.078)	(0.031)	(−0.522)	(0.538)	(0.137)	(−0.271)	(0.358)	(−0.928)	(−0.287)	(−0.220)	(−1.228)	(−1.255)	(−2.867)
Book-to-market ($t-1$)	−0.059	−0.113**	−0.128***	−0.078*	−0.057	−0.038	−0.001	−0.095**	−0.050	−0.049	−0.058	−0.125**	−0.130***	−0.111***	−0.056***
	(−0.662)	(−2.254)	(−3.280)	(−2.024)	(−1.163)	(−0.834)	(−1.613)	(−2.451)	(−1.340)	(−1.262)	(−1.333)	(−2.565)	(−3.397)	(−3.193)	(−2.406)
Past 12-month returns ($t-1$)	0.240***	0.137***	0.147***	0.154***	0.151***	0.246***	0.136***	0.146***	0.157***	0.152***	0.247***	0.135***	0.144***	0.152***	0.148***
	(6.969)	(2.851)	(3.459)	(3.877)	(4.279)	(7.335)	(2.844)	(3.404)	(3.862)	(4.265)	(7.377)	(2.753)	(3.364)	(3.830)	(4.254)
Gross profitability ($t-1$)	0.146***	0.138***	0.100***	0.126***	0.087***	0.064*	0.094***	0.084***	0.102***	0.092**	0.139***	0.131***	0.14***	0.134***	0.096***
	(3.262)	(4.154)	(4.087)	(6.414)	(6.576)	(1.907)	(2.923)	(3.381)	(4.973)	(2.385)	(2.937)	(4.219)	(4.712)	(6.920)	(4.301)
Volatility ($t-1$)	0.296***	0.264***	0.264***	0.271***	0.274***	0.292***	0.256***	0.256***	0.265***	0.265***	0.299***	0.268***	0.269***	0.272***	0.275***
	(19.127)	(16.593)	(18.653)	(20.584)	(21.726)	(19.193)	(16.097)	(18.566)	(20.066)	(20.100)	(20.070)	(16.962)	(19.600)	(21.771)	(22.366)
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,609	10,860	15,520	19,957	24,355	5,459	10,574	15,067	19,496	23,874	5,532	10,635	15,194	19,478	23,659
R^2	0.427	0.396	0.401	0.402	0.414	0.433	0.391	0.397	0.386	0.404	0.435	0.396	0.399	0.401	0.409

(b) Table V, ratio tests

5.7 Table VI: ETF ownership and the churn ratio of stock traders

Read:

- Panel A shows that stocks with higher ETF ownership have higher adjusted churn ratios among institutional traders.
- In the S&P 500, a one-standard-deviation increase in ETF ownership is associated with about 0.12 standard deviations higher churn in a key OLS specification.
- The Russell IV specifications broadly support the same direction.

Economic message. ETFs do not only attract high-turnover traders to ETF shares; they also appear to transmit that high-turnover clientele to the underlying stocks.

Table VI

ETF Ownership and Churn Ratio of Stock Traders

The table presents evidence about the relation between ETF ownership and the churn ratio of the underlying stocks, using Ancerno data. Panel A reports estimates from stock-quarter regressions of the form: $\text{Adjusted Churn Ratio}_{i,t} = \alpha + \beta \frac{\text{ETF Ownership}_{i,t}}{\text{Mkt Cap}_{i,t}} + \gamma \frac{\text{Mkt Cap}_{i,t}}{\text{Mkt Cap}_{i,t}} + \Gamma \mathbf{X}_{i,t} + \epsilon_{i,t}$. The dependent variable is the quarterly churn ratio, which is defined as *Adjusted Churn Ratio*$_{i,t} = 1 - \frac{\text{Min}(\text{Buy Trading}_{i,t}, \text{Sell Trading}_{i,t})}{\text{Buy Trading}_{i,t} + \text{Sell Trading}_{i,t}}$. The main explanatory variable is ETF ownership. Both variables are standardized. Panel B reports second-stage IV estimates from a quasi-natural experiment relying on the reconstitution of the Russell 1000 and Russell 2000 indexes. The sample includes all stocks in the Russell 1000 and Russell 2000 indexes, and the instrument is a dummy for inclusion in the Russell 2000, for stocks in the Russell 1000 before index reconstitution (columns (1) and (2)), and a dummy for inclusion in the Russell 1000, for stocks in the Russell 2000 before index reconstitution (columns (6) to (10)). Stocks are ranked in terms of market capitalization in May of each year. Different ranges of this rank around the cutoff are used for inclusion in the sample: 100 stocks on each side (columns (1) and (6)), 200 stocks on each side (columns (2) and (7)), 300 stocks on each side (columns (3) and (8)), 400 stocks on each side (columns (4) and (9)), and 500 stocks on each side (columns (5) and (10)). The same stocks enter the sample in data after index reconstitution and are dropped in the data after the end of the next year, except if delistings occur. In all panels, the dependent variable and the ownership variables are standardized by subtracting the mean and dividing by the standard deviation. The controls in Panels A and B include lagged market capitalization, the lagged reverse share price, the lagged Amihud (2002) ratio, the lagged average bid-ask spread, the lagged book-to-market ratio, the lagged past 12-month returns, lagged gross profitability (Novy-Marx and Velikov (2024)), the lagged dependent variable (a sum of the columns, index fund ownership, active fund ownership, and hedge fund ownership. Stock and quarter fixed effects are included. Standard errors are double-clustered at the stock and quarter levels. t-statistics are presented in parentheses. *, ** , and ***, indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample covers the period January 2005 to December 2014.

Panel A: OLS Specification

Dependent Variable:	Adjusted Churn Ratio (t)			
	(1)	(2)	(3)	(4)
ETF ownership ($t-1$)	0.165***	0.123***	0.064***	0.059***
	(5.111)	(5.250)	(4.950)	(4.359)
lagMktcap ($t-1$)	−0.125***	−0.125***	−0.125***	−0.125***
	(12.870)	(12.352)	(10.231)	(12.993)
1/Price ($t-1$)	0.103	0.113	0.497***	0.295***
	(0.811)	(0.957)	(3.162)	(2.746)
Amihud ($t-1$)	20.440***	20.443***	20.443***	20.443***
	(10.870)	(10.310)	(10.231)	(11.993)
Bid-ask spread ($t-1$)	−0.325***	−0.325***	−0.325***	−0.325***
	(−3.746)	(−3.746)	(−3.746)	(−3.746)
Book-to-market ($t-1$)	0.165***	0.165***	0.165***	0.165***
	(4.950)	(4.950)	(4.950)	(4.950)
Past 12-month returns ($t-1$)	0.111***	0.111***	0.111***	0.111***
	(3.364)	(3.364)	(3.364)	(3.364)
Gross profitability ($t-1$)	0.077	0.077	0.077	0.077
	(0.955)	(0.955)	(0.955)	(0.955)
Volatility ($t-1$)	0.270***	0.270***	0.270***	0.270***
	(8.549)	(8.549)	(8.549)	(8.549)
Index fund ownership ($t-1$)	0.270***	0.270***	0.270***	0.270***
	(11.213)	(11.213)	(11.213)	(11.213)
Active fund ownership ($t-1$)	0.625***	0.625***	0.625***	0.625***
	(8.488)	(8.488)	(8.488)	(8.488)
Hedge fund ownership ($t-1$)	0.194***	0.194***	0.194***	0.194***
	(−1.407)	(−1.523)	(−2.667)	(−2.658)
Adjusted churn ratio ($t-1$)		0.175***	0.202***	0.202***
		(14.925)	(14.925)	(14.925)
Quarter fixed effects	Yes	Yes	Yes	Yes
Stock fixed effects	Yes	Yes	Yes	Yes
Observations	20,464	20,464	20,387	20,387
R^2	0.469	0.580	0.459	0.529

(*Continued*)

(a) Table VI, description and Panel A

Table VI—*Continued*

Panel B: OLS Specification

Dependent Variable:	Adjusted Churn Ratio (t)			
	(1)	(2)	(3)	(4)
Amihud ($t-1$)	20.440*	20.435**	0.033	0.139
	(1.833)	(2.024)	(1.210)	(0.930)
Bid-ask spread ($t-1$)	−0.325	−0.325	−0.325	−0.325
	(−0.208)	(−0.409)	(−1.123)	(−1.585)
Book-to-market ($t-1$)	−0.053	−0.053	0.005	0.030
	(−0.955)	(−0.559)	(0.247)	(0.500)
Past 12-month returns ($t-1$)	0.111***	0.111***	0.003	0.017
	(3.364)	(3.364)	(0.255)	(0.511)
Gross profitability ($t-1$)	0.077	0.085	−0.015	−0.011
	(0.955)	(0.585)	(−0.631)	(−0.648)
Index fund ownership ($t-1$)	1.425	1.180	−1.444*	−0.651
	(0.570)	(0.549)	(−2.043)	(−1.721)
Active fund ownership ($t-1$)	0.625***	0.625***	0.625***	0.625***
	(3.213)	(4.62)	(7.58)	(6.48)
Hedge fund ownership ($t-1$)	0.488	0.436	−0.248***	−0.194***
	(−1.407)	(−1.523)	(−2.667)	(−2.658)
Adjusted churn ratio ($t-1$)		0.175***	0.202***	0.202***
		(14.925)	(14.925)	(14.925)
Quarter fixed effects	Yes	Yes	Yes	Yes
Stock fixed effects	Yes	Yes	Yes	Yes
Observations	20,464	20,464	19,387	19,387
R^2	0.469	0.580	0.459	0.529

(*Continued*)

(b) Table VI, Panel B part 1

Table VI—*Continued*

Panel B: IV Specification

Dependent Variable:	Adjusted Churn Ratio (t)									
Instrument:	Switch to the Russell 2000				Switch to the Russell 1000					
Bandwidth:	± 100	± 200	± 300	± 400	± 500	± 100	± 200	± 300	± 400	± 500
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Switch indicator	0.741***	0.462***	0.366*	0.811*	0.117**	0.321	−0.649	−0.086	−0.455	−0.020
	(3.372)	(3.516)	(2.444)	(0.914)	(−2.158)	(1.618)	(−0.705)	(−1.181)	(−0.420)	(−4.487)
lagMktcap ($t-1$)	−0.125***	−0.125***	−0.125***	−0.125***	−0.125***	−0.125***	−0.125***	−0.125***	−0.125***	−0.125***
	(7.096)	(9.386)	(9.135)	(11.642)	(12.355)	(5.236)	(5.866)	(8.475)	(9.868)	(9.934)
1/Price ($t-1$)	1.632***	1.642***	1.550***	1.207***	1.530***	2.000***	1.522***	1.026***	1.443***	1.390***
	(5.375)	(6.434)	(7.193)	(7.951)	(7.791)	(9.153)	(7.769)	(7.564)	(8.199)	(9.643)
Amihud ($t-1$)	−0.314	−1.624	−2.595***	−3.355***	−1.237*	1.557	−2.392	−3.420*	−2.769**	−2.287*
	(−0.195)	(−1.324)	(−2.167)	(−2.767)	(−1.775)	(0.966)	(−1.455)	(−1.875)	(−2.167)	(−1.775)
Bid-ask spread ($t-1$)	−11.618***	−6.360***	−12.780***	−9.648***	−8.965***	−16.657***	−14.890***	−12.980***	−12.238***	−14.620***
	(−5.407)	(−2.803)	(−5.018)	(−5.518)	(−5.501)	(−5.111)	(−6.709)	(−8.748)	(−9.024)	(−8.776)
Book-to-market ($t-1$)	0.175**	0.150***	0.150***	0.149***	0.151***	0.150***	0.150***	0.150***	−0.008*	0.062**
	(1.203)	(1.605)	(2.028)	(1.938)	(2.969)	(−2.126)	(−2.281)	(−2.541)	(−2.322)	(−2.288)
Past 12-month returns ($t-1$)	0.111***	0.111***	0.111***	0.111***	0.111***	0.111***	0.111***	0.111***	0.111***	0.111***
	(−2.286)	(−0.034)	(0.091)	(0.083)	(0.051)	(0.137)	(0.172)	(0.183)	(0.742)	(0.519)
Gross profitability ($t-1$)	0.072	0.086*	0.037	−0.015	−0.026	0.132**	−0.047	−0.054***	−0.048**	−0.032
	(1.175)	(1.795)	(0.954)	(−0.97)	(−0.08)	(2.913)	(−1.346)	(−3.061)	(−2.308)	(−1.738)
Lagged adjusted churn ratio	0.194***	0.209***	0.211***	0.218***	0.229***	0.209***	0.264***	0.242***	0.236***	0.229***
	(−0.251)	(−0.267)	(−0.267)	(−0.267)	(−0.267)	(−0.267)	(−0.267)	(−0.267)	(−0.267)	(−0.267)
Index fund ownership ($t-1$)	0.051	0.067**	0.086**	0.206**	0.186**	0.126	0.146**	0.146**	0.146**	0.146**
	(1.566)	(2.059)	(6.222)	(11.303)	(5.069)	(0.671)	(7.767)	(7.166)	(6.723)	(6.726)
Active fund ownership ($t-1$)	0.175***	0.138***	0.131***	0.150***	0.156***	0.131***	0.131***	0.131***	0.131***	0.131***
	(7.490)	(9.807)	(14.278)	(33.814)	(19.995)	(11.023)	(13.836)	(15.726)	(15.232)	(19.195)
Hedge fund ownership ($t-1$)	0.136***	0.272***	0.045***	0.027**	0.046***	0.045*	0.008	0.015	0.018***	0.045***
	(4.038)	(3.548)	(2.976)	(2.954)	(4.594)	(1.893)	(0.416)	(1.955)	(2.892)	(5.97)
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,940	10,977	16,893	22,208	28,574	6,482	12,726	18,206	23,641	29,054

(c) Table VI, Panel B part 2

5.8 Table VII: ETF flows and return reversals

Read:

- ETF flows create contemporaneous price pressure in the underlying stocks.
- A one-standard-deviation stock-level ETF flow is associated with roughly 12 bps same-day price movement for S&P 500 stocks.
- Much of the price pressure reverses over the following 40 trading days.
- Ancerno price-impact estimates support the magnitude of the flow-induced price impact.

Economic message. Return reversal is the main evidence that ETF-induced volatility is not simply price discovery. It is consistent with temporary nonfundamental demand shocks.

Table VII
ETF Flows, Stock Returns, and Price Impact

Panel A DGTW-adjusted cumulative returns (Daniel et al. (1997)) over different horizons starting on day t on stock-level ETF flows on day t. The analysis is at the stock-day level. ETF flows are scaled by market capitalization and standardized. The controls in all panels include logged market capitalization, the lagged inverse share price, the lagged Amihud (2002) ratio, lagged average bid-ask spread, lagged book-to-market ratio, lagged past 12-month returns, lagged gross profitability (as in Novy-Marx (2013)), stock-level order imbalance, and lagged returns. Stock and quarter fixed effects are included in Panel A, and quarter fixed effects are included in Panel B. Standard errors are double-clustered at the stock and time levels. Panel B reports estimates from ordinary least squares (OLS) regressions of price impact on turnover and turnover squared. The sample includes trade-level observations from Ancerno data. Price impact is defined as the percentage difference between the execution price and the price at time of placement. Turnover is measured as dollar volume of a trade as a fraction of daily dollar volume in CRSP. Day and stock fixed effects are included. Standard errors are double-clustered at the stock and time levels. The sample covers the period January 2000 to December 2014. t-statistics are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: ETF Flows and Stock Returns

Sample:	S&P 500					Russell 3000				
Dependent Variable:	Ret(t) (1)	Ret($t,t+4$) (2)	Ret($t,t+9$) (3)	Ret($t,t+19$) (4)	Ret($t,t+39$) (5)	Ret(t) (6)	Ret($t,t+4$) (7)	Ret($t,t+9$) (8)	Ret($t,t+19$) (9)	Ret($t,t+39$) (10)
ETF flows (t)	0.122***	0.111***	0.062***	0.046*	0.015	0.040***	0.034***	0.027***	0.016*	−0.000
	(13.433)	(7.469)	(3.233)	(1.848)	(0.416)	(15.069)	(6.649)	(3.995)	(1.669)	(−0.006)
log(Mktcap ($t-1$))	0.048***	0.039***	0.033**	0.040	0.050	0.068***	0.022***	0.044***	0.080***	0.181***
	(14.352)	(4.750)	(2.003)	(1.216)	(0.736)	(6.956)	(7.371)	(7.942)	(8.579)	(8.896)
1/Price ($t-1$)	−0.870***	0.209	1.471**	4.131***	9.562***	−0.316***	0.100	0.612***	1.819***	4.754***
	(−4.084)	(0.835)	(2.555)	(3.365)	(3.386)	(−10.093)	(1.302)	(4.369)	(6.737)	(8.791)
Amihud ($t-1$)	37.332***	1.842	−31.973	−72.013	−159.667	0.135***	−0.813***	−1.868***	−3.664***	−6.662***
	(6.715)	(0.139)	(−1.208)	(−1.332)	(−1.482)	(2.777)	(−8.169)	(−10.661)	(−11.816)	(−11.964)
Bid-ask spread ($t-1$)	−2.450**	2.411	6.631*	19.021***	29.763**	0.781*	0.135	0.245	1.653	4.534
	(−2.505)	(1.132)	(1.759)	(2.671)	(2.220)	(1.853)	(0.157)	(0.186)	(0.716)	(1.046)
Book-to-market ($t-1$)	0.020*	0.014	0.011	−0.001	−0.020	0.017***	0.039***	0.062***	0.107**	0.171**
	(1.702)	(0.565)	(0.232)	(−0.013)	(−0.106)	(3.511)	(2.951)	(2.622)	(2.333)	(1.986)
Past 12-month returns ($t-1$)	−0.014	−0.016	−0.036	0.067	0.308	−0.020***	−0.007	−0.006	0.017	0.043
	(−1.591)	(−0.567)	(−0.699)	(0.673)	(1.490)	(−5.525)	(−0.657)	(−0.306)	(0.452)	(0.581)
Gross profitability ($t-1$)	0.035**	0.053	0.045	0.064	0.152	0.049***	0.222***	0.403***	0.690***	1.210***
	(2.052)	(1.254)	(0.627)	(0.481)	(0.571)	(5.425)	(9.468)	(10.277)	(9.918)	(9.200)
Order imbalance ($t-1$)	0.003***	0.003***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(20.893)	(18.073)	(13.541)	(9.855)	(4.915)	(75.636)	(61.639)	(53.132)	(41.312)	(27.502)

(Continued)

(a) Table VII, flows and returns

Table VII—*Continued*

Panel A: ETF Flows and Stock Returns

Sample:	S&P 500					Russell 3000				
Dependent Variable:	Ret(t) (1)	Ret($t,t+4$) (2)	Ret($t,t+9$) (3)	Ret($t,t+19$) (4)	Ret($t,t+39$) (5)	Ret(t) (6)	Ret($t,t+4$) (7)	Ret($t,t+9$) (8)	Ret($t,t+19$) (9)	Ret($t,t+39$) (10)
Ret($t-1$)	−2.587***					−3.364***				
	(−8.348)					(−19.595)				
Ret($t-1,t-5$)		−2.199***					−1.571***			
		(−7.195)					(−10.302)			
Ret($t-1,t-10$)			−2.266***					−1.861***		
			(−7.337)					(−12.330)		
Ret($t-1,t-20$)				−2.496***					−1.873***	
				(−7.010)					(−11.240)	
Ret($t-1,t-40$)					−3.008***					−1.609***
					(−6.340)					(−7.837)
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,492,313	1,492,313	1,492,313	1,492,313	1,492,313	7,759,143	7,759,143	7,759,143	7,759,143	7,759,143
R^2	0.033	0.013	0.011	0.011	0.013	0.039	0.009	0.007	0.006	0.006

Panel B: Price Impact on Turnover

Dependent Variable:	Price Impact			
Sample:	S&P 500		Russell 3000	
	(1)	(2)	(3)	(4)
Turnover (%)	3.608***	3.621***	3.426***	3.465***
	(34.627)	(36.255)	(47.787)	(41.592)
Turnover (%) ^2	−0.148***	−0.148***	−0.131***	−0.131***
	(−29.961)	(−30.910)	(−39.559)	(−35.681)
Constant	2.598***		3.199***	
	(15.909)		(15.126)	
Day fixed effects	No	Yes	No	Yes
Stock fixed effects	No	Yes	No	Yes
Observations	27,960,051	27,960,051	53,167,782	53,167,760
R^2	0.001	0.009	0.002	0.011

(b) Table VII, price impact

5.9 Table VIII: Limits to arbitrage

Read:

- Absolute ETF mispricing predicts higher next-day intraday stock volatility.
- The effect is weaker for stocks with high bid-ask spreads.
- The effect is also weaker when lending fees are high, especially for negative mispricing episodes that require shorting.

Economic message. The volatility effect operates through arbitrage. When arbitrage is expensive, ETF mispricing is less strongly transmitted to the underlying stock.

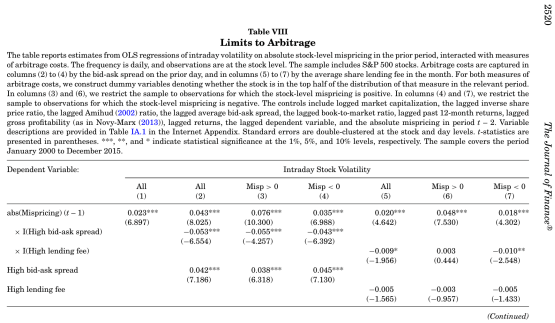

Table VIII
Limits to Arbitrage

The table reports estimates from OLS regressions of intraday volatility on absolute stock-level mispricing in the prior period, interacted with measures of arbitrage costs. The frequency is daily, and observations are at the stock level. The sample includes S&P 500 stocks. Arbitrage costs are captured in columns (2) to (4) by the bid-ask spread on the prior day, and in columns (5) to (7) by the average share lending fee in the month. For both measures of arbitrage costs, we construct dummy variables denoting whether the stock is in the top half of the distribution of that measure in the relevant period. In columns (3) and (6), we restrict the sample to observations for which the stock-level mispricing is positive. In columns (4) and (7), we restrict the sample to observations for which the stock-level mispricing is negative. The controls include logged market capitalization, the logged inverse share price ratio, the lagged Amihud (2002) ratio, the lagged average bid-ask spread, the lagged book-to-market ratio, lagged past 12-month returns, lagged gross profitability (as in Novy-Marx (2013)), lagged returns, the lagged dependent variable, and the absolute mispricing in period $t-2$. Variable descriptions are provided in Table IA.1 in the Internet Appendix. Standard errors are double-clustered at the stock and day levels. t-statistics are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample covers the period January 2000 to December 2015.

Dependent Variable:	Intraday Stock Volatility						
	All (1)	All (2)	Misp > 0 (3)	Misp < 0 (4)	All (5)	Misp > 0 (6)	Misp < 0 (7)
abs(Mispricing) ($t-1$)	0.023***	0.043***	0.076***	0.035***	0.020***	0.048***	0.018***
	(6.897)	(8.025)	(10.300)	(6.988)	(4.642)	(7.530)	(4.302)
× I(High bid-ask spread)		−0.053***	−0.055***	−0.043***			
		(−6.554)	(−4.257)	(−6.392)			
× I(High lending fee)					−0.009*	0.003	−0.010**
					(−1.956)	(0.444)	(−2.548)
High bid-ask spread		0.042***	0.038***	0.045***			
		(7.186)	(6.318)	(7.130)			
High lending fee					−0.005	−0.003	−0.005
					(−1.565)	(−0.957)	(−1.433)

(Continued)

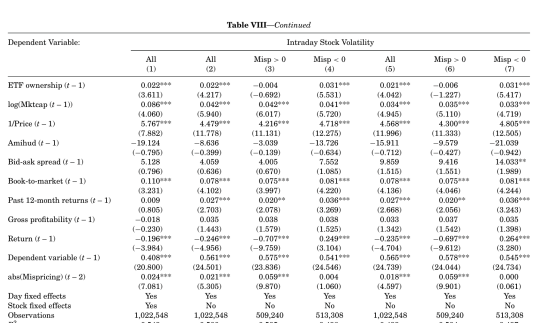

Table VIII—*Continued*

Dependent Variable:	Intraday Stock Volatility						
	All (1)	All (2)	Misp > 0 (3)	Misp < 0 (4)	All (5)	Misp > 0 (6)	Misp < 0 (7)
ETF ownership ($t-1$)	0.022***	0.022***	−0.004	0.031***	0.021***	−0.006	0.031***
	(3.611)	(4.217)	(−0.692)	(5.531)	(4.042)	(−1.227)	(5.417)
log(Mktcap ($t-1$))	0.086***	0.042***	0.042***	0.041***	0.034***	0.035***	0.033***
	(4.060)	(5.940)	(6.017)	(5.720)	(4.945)	(5.110)	(4.719)
1/Price ($t-1$)	5.767***	4.479***	4.216***	4.718***	4.568***	4.300***	4.805***
	(7.882)	(11.778)	(11.131)	(12.275)	(11.996)	(11.333)	(12.505)
Amihud ($t-1$)	−19.124	−8.636	−3.039	−13.726	−15.911	−9.579	−21.039
	(−0.795)	(−0.399)	(−0.139)	(−0.634)	(−0.712)	(−0.427)	(−0.942)
Bid-ask spread ($t-1$)	5.128	4.059	4.005	7.552	9.859	9.416	16.033**
	(0.796)	(0.636)	(0.670)	(1.085)	(1.515)	(1.551)	(1.989)
Book-to-market ($t-1$)	0.110***	0.078***	0.075***	0.081***	0.078***	0.075***	0.081***
	(3.231)	(4.102)	(3.997)	(4.220)	(4.136)	(4.046)	(4.244)
Past 12-month returns ($t-1$)	0.009	0.027***	0.029**	0.036***	0.027***	0.020**	0.036***
	(0.805)	(2.703)	(2.078)	(3.269)	(2.668)	(2.056)	(3.243)
Gross profitability ($t-1$)	−0.018	0.035	0.038	0.038	0.033	0.037	0.035
	(−0.230)	(1.443)	(1.579)	(1.525)	(1.342)	(1.542)	(1.398)
Return ($t-1$)	−0.196***	−0.246***	−0.707***	0.249***	−0.235***	−0.697***	0.284***
	(−3.984)	(−4.956)	(−9.759)	(3.104)	(−4.704)	(−9.812)	(3.280)
Dependent variable ($t-1$)	0.408***	0.561***	0.575***	0.541***	0.565***	0.578***	0.545***
	(20.800)	(24.501)	(23.836)	(24.546)	(24.739)	(24.044)	(24.734)
abs(Mispricing) ($t-2$)	0.024***	0.021***	0.059***	0.004	0.018***	0.059***	0.000
	(7.081)	(5.305)	(9.870)	(1.060)	(4.597)	(9.901)	(0.061)
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock fixed effects	Yes	No	No	No	No	No	No
Observations	1,022,548	1,022,548	509,240	513,308	1,022,548	509,240	513,308
R^2	0.549	0.500	0.505	0.498	0.499	0.504	0.497

(a) Table VIII, limits to arbitrage part 1

(b) Table VIII, limits to arbitrage part 2

5.10 Table IX: Variance ratios and mean reversion

Read:

- ETF ownership raises the absolute deviation of the variance ratio from a random walk benchmark.
- The signed variance-ratio tests show more negative return autocorrelation.
- The Russell IV specifications reinforce the same conclusion.

Economic message. Higher ETF ownership makes prices more mean reverting. This supports the view that ETF ownership adds noise rather than only speeding up fundamental information diffusion.

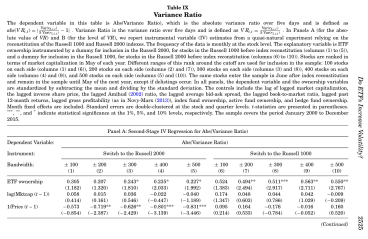

Table IX
Variance Ratio

The dependent variable in this table is Abs(Variance Ratio), which is the absolute variance ratio over five days and is defined as $\text{abs}(VR_t) = |\frac{\text{Var}(r_{t-4})}{5\text{Var}(r_t)} - 1|$. Variance Ratio is the variance ratio over five days and is defined as $VR_t = \frac{\text{Var}(r_{t-4})}{5\text{Var}(r_t)}$. In Panels A (for the absolute value of VR) and B (for the level of VR), we report instrumental variable (IV) estimates from a quasi-natural experiment relying on the reconstitution of the Russell 1000 and Russell 2000 indexes. The frequency of the data is monthly at the stock level. The explanatory variable is ETF ownership, measured as the fraction of shares outstanding held by ETFs. The instrument is a dummy variable denoting whether a stock is in the Russell 2000 index (treatment) or the Russell 1000 (the control group) in the Russell 1000/2000 index reconstitution (columns (6) to (10)). Stocks are ranked in terms of market capitalization in May of each year. Different ranges of this rank around the cutoff are used for inclusion in the sample: 150 stocks on each side (columns (1) and (6)), 200 stocks on each side (columns (2) and (7)), 300 stocks on each side (columns (3) and (8)), 400 stocks on each side (columns (4) and (9)), and 500 stocks on each side (columns (5) and (10)). The same stocks enter the sample in June after index reconstitution and remain in the sample until May of the next year, except if delistings occur. In all panels, the dependent variable and the ownership variables are standardized by subtracting the mean and dividing by the standard deviation. The controls include the lag of logged market capitalization, the logged inverse share price, the lagged Amihud (2002) ratio, the lagged average bid-ask spread, the lagged book-to-market ratio, lagged past 12-month returns, lagged gross profitability (as in Novy-Marx (2013)), index fund ownership, active fund ownership, and hedge fund ownership. Month fixed effects are included. Standard errors are double-clustered at the stock and quarter levels. t-statistics are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample covers the period January 2000 to December 2015.

Panel A: Second-Stage IV Regression for Abs(Variance Ratio)

Dependent Variable:	Abs(Variance Ratio)									
Instrument:	Switch to the Russell 2000					Switch to the Russell 1000				
Bandwidth:	± 100 (1)	± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)
ETF ownership	0.265	0.287	0.243*	0.233*	0.227*	0.534	0.494**	0.511***	0.463**	0.548**
	(1.182)	(1.320)	(1.910)	(2.033)	(1.992)	(1.383)	(2.494)	(2.917)	(2.711)	(2.767)
log(Mktcap ($t-1$))	0.058	0.055	0.036	−0.022	−0.040	0.174	0.048	0.044	0.042	−0.009
	(0.414)	(0.161)	(0.546)	(−0.447)	(−1.166)	(1.347)	(0.603)	(0.706)	(1.059)	(−0.208)
1/Price ($t-1$)	−0.573	−9.719**	−6.626**	−0.663***	−3.811***	0.095	0.164	−0.176	−0.018	0.188
	(−0.054)	(−2.387)	(−2.429)	(−3.119)	(−3.446)	(0.214)	(0.553)	(−0.794)	(−0.052)	(0.528)

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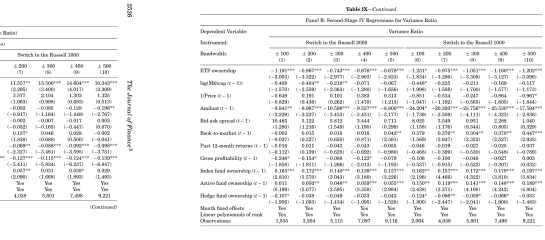

Table IX—*Continued*

Panel A: Second-Stage IV Regression for Abs(Variance Ratio)

Dependent Variable:	Abs(Variance Ratio)									
Instrument:	Switch to the Russell 2000					Switch to the Russell 1000				
Bandwidth:	± 100 (1)	± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)
Amihud ($t-1$)	3.342	1.862	5.146**	4.667**	3.254**	16.753	11.527**	13.526***	34.694***	10.340***
	(1.215)	(1.611)	(2.676)	(2.173)	(2.226)	(1.418)	(2.285)	(3.450)	(4.017)	(3.306)
Bid-ask spread ($t-1$)	−4.801	−4.072	1.400	2.757*	1.713	−6.480	3.577	2.104	1.202	1.325
	(−1.083)	(−0.692)	(0.741)	(1.771)	(1.185)	(−0.118)	(1.063)	(0.998)	(0.683)	(0.913)
Book-to-market ($t-1$)	−0.025	−0.010	−0.025	−0.022	−0.005	−0.061	−0.062	−0.035	−0.128	−0.190*
	(−0.633)	(−0.629)	(−1.454)	(−1.372)	(−0.340)	(−0.527)	(−0.917)	(−1.164)	(−1.440)	(−2.767)
Past 12-month returns ($t-1$)	−0.120**	−0.120**	−0.120**	−0.120**	−0.120**	−0.120**	−0.120**	−0.120**	−0.120**	−0.120**
	(−1.545)	(−1.633)	(−1.265)	(−0.789)	(0.189)	(0.095)	(−0.052)	(−0.195)	(−0.447)	(0.970)
Gross profitability ($t-1$)	0.087	0.133	0.090	0.113	0.094	0.040	0.137*	0.046	0.028	−0.002
	(0.640)	(1.580)	(1.444)	(1.683)	(1.624)	(0.431)	(1.638)	(0.688)	(0.506)	(−0.041)
Index fund ownership ($t-1$)	−0.079*	−0.076**	−0.065*	−0.086**	−0.089**	−0.069	−0.069**	−0.088***	−0.092***	−0.096***
	(−1.785)	(−2.181)	(−2.845)	(−2.386)	(−2.340)	(−1.437)	(−2.327)	(−5.401)	(−5.996)	(−5.751)
Active fund ownership ($t-1$)	−0.043	−0.054**	−0.061***	−0.060***	−0.054***	−0.152***	−0.127***	−0.115***	−0.124***	−0.139***
	(−1.031)	(−2.050)	(−3.207)	(−3.855)	(−4.122)	(−4.257)	(−5.411)	(−5.604)	(−6.227)	(−8.867)
Hedge fund ownership ($t-1$)	−0.008	−0.016	0.030	0.012	0.023	0.086	0.057*	0.031	0.030*	0.020
	(−0.322)	(−0.785)	(1.401)	(0.556)	(1.121)	(1.604)	(1.657)	(1.525)	(1.650)	(1.426)
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,353	3,204	5,115	7,097	9,138	2,064	4,038	6,001	7,498	9,221

(Continued)

Table IX—*Continued*

Panel B: Second-Stage IV Regressions for Variance Ratio

Dependent Variable:	Variance Ratio									
Instrument:	Switch to the Russell 2000					Switch to the Russell 1000				
Bandwidth:	± 100 (1)	± 200 (2)	± 300 (3)	± 400 (4)	± 500 (5)	± 100 (6)	± 200 (7)	± 300 (8)	± 400 (9)	± 500 (10)
ETF ownership	−1.194***	−0.867**	−0.743**	−0.743**	−0.678**	−0.678***	−1.231*	−0.973**	−1.051***	−1.166***
	(−3.003)	(−3.322)	(−2.977)	(−2.993)	(−2.603)	(−1.834)	(−2.386)	(−3.309)	(−3.127)	(−3.096)
log(Mktcap ($t-1$))	−0.459	−0.444**	−0.218**	−0.071	−0.067	−0.448*	−0.235	−0.211	−0.159	−0.117
	(−1.570)	(−2.559)	(−2.363)	(−1.288)	(−1.604)	(−1.906)	(−1.588)	(−1.708)	(−1.577)	(−1.173)
1/Price ($t-1$)	−8.649	0.191	0.101	0.383	0.313	−0.951	−0.534	−0.247	−0.904	−0.907*
	(−0.829)	(0.436)	(0.262)	(1.470)	(1.213)	(−1.047)	(−1.192)	(−0.563)	(−1.605)	(−1.844)
Amihud ($t-1$)	−8.641**	−8.667***	−10.598***	−9.757***	−8.668***	−26.204*	−20.383***	−23.734***	−25.556***	−27.594***
	(−2.320)	(−3.327)	(−5.651)	(−5.651)	(−5.117)	(−1.738)	(−3.609)	(−4.111)	(−4.333)	(−2.836)
Bid-ask spread ($t-1$)	−3.224**	−2.127**	−1.453**	−1.453**	−1.453**	−1.453**	−1.453**	−1.453**	−1.453**	−1.453**
	(1.289)	(1.210)	(1.549)	(1.195)	(0.299)	(0.156)	(1.176)	(0.344)	(0.856)	(0.329)
Book-to-market ($t-1$)	−0.082	0.015	0.018	0.018	0.042**	0.379	0.376**	0.304**	0.276**	0.447***
	(−0.837)	(0.257)	(0.663)	(0.671)	(2.591)	(1.566)	(2.647)	(2.353)	(2.557)	(2.835)
Past 12-month returns ($t-1$)	−0.018	0.011	−0.043	−0.043	−0.093	−0.046	−0.019	−0.027	−0.023	−0.037
	(−0.112)	(0.139)	(−0.628)	(−0.692)	(−1.588)	(−0.400)	(−0.239)	(−0.536)	(−0.546)	(−0.795)
Gross profitability ($t-1$)	−0.249*	−0.154*	−0.068	−0.123*	−0.079	−0.106	−0.100	−0.048	−0.027	0.003
	(−1.648)	(−1.811)	(−1.266)	(−2.013)	(−1.191)	(−0.557)	(−0.913)	(−0.522)	(−0.307)	(0.032)
Index fund ownership ($t-1$)	0.163***	0.172***	0.148***	0.138***	0.157***	0.162**	0.157***	0.172***	0.179***	0.197***
	(3.622)	(4.565)	(6.107)	(5.750)	(6.125)	(2.525)	(3.000)	(3.966)	(4.188)	(4.589)
Active fund ownership ($t-1$)	0.011	0.050**	0.040*	0.058***	0.052**	0.156**	0.118***	0.141***	0.144***	0.192***
	(0.199)	(2.077)	(2.585)	(3.258)	(2.984)	(2.426)	(3.275)	(4.100)	(4.243)	(6.804)
Hedge fund ownership ($t-1$)	−0.197*	−0.038	−0.049	−0.053	−0.043	−0.124*	−0.088**	−0.059*	−0.066*	−0.053
	(−1.956)	(−1.063)	(−1.454)	(−1.595)	(−1.528)	(−1.906)	(−2.447)	(−2.041)	(−1.908)	(−1.483)
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Linear polynomials of rank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,353	3,204	5,115	7,097	9,138	2,064	4,038	5,801	7,498	9,221

(a) Table IX, description and Panel A

(b) Table IX, Panel A continued

(c) Table IX, Panel B

5.11 Table X: ETF ownership portfolios and expected returns

Read:

- Average raw excess returns increase from the low ETF ownership quintile to the high ETF ownership quintile.
- The high-minus-low ETF ownership portfolio earns about 35 bps per month in raw returns.
- Factor-model alphas remain significant at about 30–38 bps per month in the full sample.
- Fama–MacBeth regressions show lagged ETF ownership remains positively related to abnormal returns even when ETF flows and controls are included.

Economic message. ETF ownership appears to create or reveal a priced risk exposure. The added volatility is not merely a diversifiable nuisance at the individual-stock level.

Table X

ETF Ownership Portfolios

The table reports statistics and regression analysis for portfolios based on ETF ownership. Each month, five equally weighted portfolios are formed on the basis of the five quintiles of the distribution of ETF ownership in the previous month. Panel A presents the raw returns. Panel B presents factor model regressions for the high-ETF-ownership minus the low-ETF-ownership portfolio. The factors are the five Fama and French (2015) factors (MKTRF, HML, SMB, RMW, CMA), momentum (UMD), and the Pástor and Stambaugh (2003) traded liquidity factor (PS_VWF). Panel C reports estimates from Fama and MacBeth (1973) regressions of four-factor model-adjusted (Carhart (1997)) monthly stock returns on ETF ownership in the previous month, contemporaneous ETF stock-level flows, index, active, and hedge fund ownership, and control variables. The dependent variable is expressed as a percentage, and both the ownership variables and flows are standardized. The controls include logged market capitalization, the lagged inverse share price ratio, the lagged Amihud (2002) ratio, the lagged average bid-ask spread, the lagged book-to-market ratio, lagged past 12-month returns, and lagged gross profitability (as in Novy-Marx (2013)). t-statistics are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample covers the period January 2000 to December 2015.

Panel A: Raw Excess Returns for the Quintile Portfolios

	Quintiles Based on ETF Ownership				
	Low	(2)	(3)	(4)	High
Raw excess returns	0.389	0.618*	0.696*	0.739**	0.737*
	(1.051)	(1.736)	(1.941)	(2.040)	(1.828)
Number of months	191	191	191	191	191

Panel B: High-Minus-Low Portfolio, Full Sample

Dependent Variable:	Ret(High-Minus-Low ETF Ownership)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Alpha	0.347**	0.303**	0.334**	0.355**	0.364**	0.350**	0.383**	0.383**
	(2.296)	(2.074)	(2.294)	(2.429)	(2.477)	(2.287)	(2.482)	(2.461)
MKTRF		0.130***	0.126***	0.136***	0.125***	0.132***	0.119***	0.119***
		(4.012)	(3.915)	(4.126)	(3.437)	(3.204)	(2.847)	(2.829)
HML			−0.089**	−0.095**	−0.101**	−0.111**	−0.051	−0.051
			(−1.996)	(−2.127)	(−2.223)	(−2.046)	(−0.749)	(−0.738)
SMB				−0.061	−0.054	−0.044	−0.036	−0.036
				(−1.316)	(−1.132)	(−0.778)	(−0.645)	(−0.620)
UMD					−0.021	−0.023	−0.014	−0.014
					(−0.747)	(−0.787)	(−0.475)	(−0.474)
RMW						0.025	0.016	0.016
						(0.340)	(0.220)	(0.219)
CMA							−0.136	−0.136
							(−1.460)	(−1.455)
PS_VWF								−0.001
								(−0.021)
Number of months	191	191	191	191	191	191	191	191
R^2	0.000	0.078	0.098	0.106	0.109	0.109	0.119	0.119

(*Continued*)

(a) Table X, portfolio returns and alphas

Table X—*Continued*

Panel C: Fama and MacBeth (1973) Regressions

Dependent Variable:	Four-Factor Model-Adjusted Returns (t)				
	(1)	(2)	(3)	(4)	(5)
ETF ownership ($t-1$)	0.144**	0.161**	0.195***		0.199***
	(2.382)	(2.536)	(2.862)		(2.642)
ETF flows (t)				0.099**	0.080
				(2.009)	(1.452)
Hedge fund ownership ($t-1$)		0.062	0.024	0.026	0.021
		(1.198)	(0.444)	(0.474)	(0.376)
Index fund ownership ($t-1$)		−0.055	−0.065	−0.025	−0.067
		(−1.145)	(−1.363)	(−0.575)	(−1.398)
Active fund ownership ($t-1$)		0.075	0.049	0.053	0.040
		(1.231)	(0.973)	(1.048)	(0.819)
log(Mktcap ($t-1$))			0.109*	0.029	0.078
			(1.895)	(0.450)	(1.310)
1/Price ($t-1$)			6.458***	6.440***	6.206***
			(5.197)	(5.209)	(5.011)
Amihud ($t-1$)			3.074	−10.612	6.454
			(0.182)	(−0.607)	(0.364)
Bid-ask spread ($t-1$)			−18.181	−21.054	−17.810
			(−1.281)	(−1.479)	(−1.254)
Book-to-market ($t-1$)			−0.068	−0.095	−0.067
			(−0.311)	(−0.440)	(−0.304)
Past 12-month returns ($t-1$)			−0.430	−0.408	−0.417
			(−1.495)	(−1.442)	(−1.453)
Gross profitability ($t-1$)			0.709**	0.659**	0.702**
			(2.332)	(2.181)	(2.321)
Observations	350,237	350,237	350,237	350,237	350,237
R^2	0.003	0.011	0.037	0.036	0.039
Number of months	191	191	191	191	191

the first specification reveals a positive and significant relation between returns and standardized ETF ownership. A one-standard-deviation increase in ETF ownership correlates with a 14 bps increase in returns. The next specification includes ownership by other types of institutions, whose effect is not significant, although it is positive in the case of active mutual funds and hedge funds. We also add controls for liquidity and stock characteristics typically associated with returns. We note a significant profitability effect, consistent with Novy-Marx (2013), whereas the other asset pricing effects are insignificant, probably due to the four-factor adjustment of the dependent variable. In column (4), ETF flows display a significant correlation with returns when ETF ownership is not included. However, a horse race between the two variables reveals that ETF ownership is the dominant determinant of stock returns (column (5)). This finding rules out the possibility that the alphas we identify are due to the price pressure of ETF flows.

Overall, these results support the argument that ETFs significantly modify the underlying stocks' return distribution. As ETFs increase the volatility of stock returns, they appear to introduce a nondiversifiable source of risk, at

(b) Table X, Fama–MacBeth regressions

6 Short summary

- The paper studies whether ETFs increase the volatility of their underlying stocks.
- The hypothesized channel is liquidity-shock propagation through ETF arbitrage.
- ETFs are more liquid than underlying stocks and attract higher-turnover investors.
- ETF ownership is positively related to daily stock volatility in OLS.
- The Russell 1000/2000 reconstitution provides quasi-exogenous variation in ETF ownership.
- The IV results show that ETF-induced ownership changes raise stock volatility.
- ETF ownership also raises the churn ratio of traders in the underlying stocks.
- ETF flows generate same-day price pressure that subsequently reverses.
- Variance-ratio tests show greater deviation from a random walk and more negative autocorrelation.
- The arbitrage-channel evidence is strongest when ETF mispricing is high and arbitrage is not too costly.
- High-ETF-ownership stocks earn positive return premia.
- The overall conclusion is that ETFs can add nonfundamental volatility and systematic risk to the underlying securities.

7 Conclusion

7.1 Core conclusion

Ben-David, Franzoni, and Moussawi show that ETF ownership is associated with higher stock-level volatility and provide quasi-experimental evidence that the relation is causal. The mechanism is not simply that ETFs hold volatile stocks. Rather, ETF trading and arbitrage transmit short-horizon liquidity demand into the underlying stocks.

7.2 Economic intuition

The economic intuition is that ETFs create a very cheap trading venue for baskets. Investors trade the ETF for liquidity, hedging, or short-horizon reasons. When the ETF price deviates from its NAV, arbitrageurs trade the component stocks. This mechanical arbitrage makes the component stocks inherit the ETF-level demand shock. Because the shock is at least partly temporary, prices later mean revert.

7.3 Takeaway

ETFs improve access to diversification and liquidity, but they also create a channel through which nonfundamental demand shocks propagate to individual stocks. ETF ownership is therefore not only an ownership statistic; it is a measure of exposure to a trading technology that can affect volatility, return autocorrelation, and expected returns.