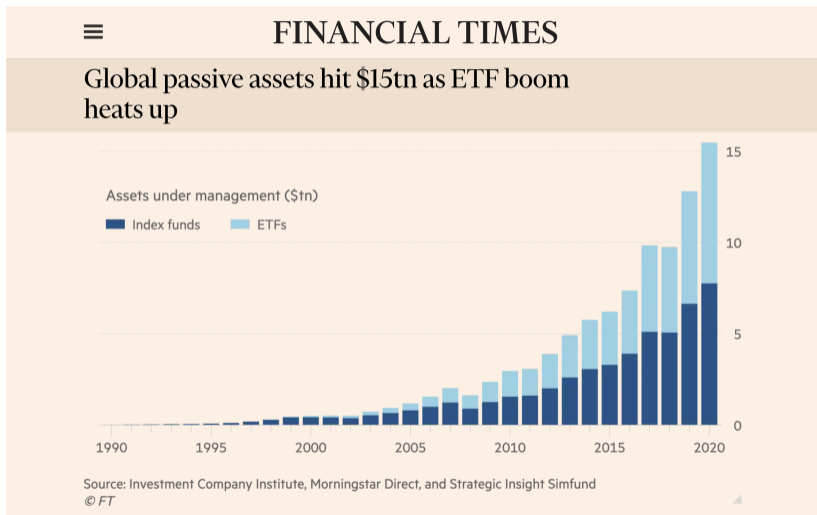


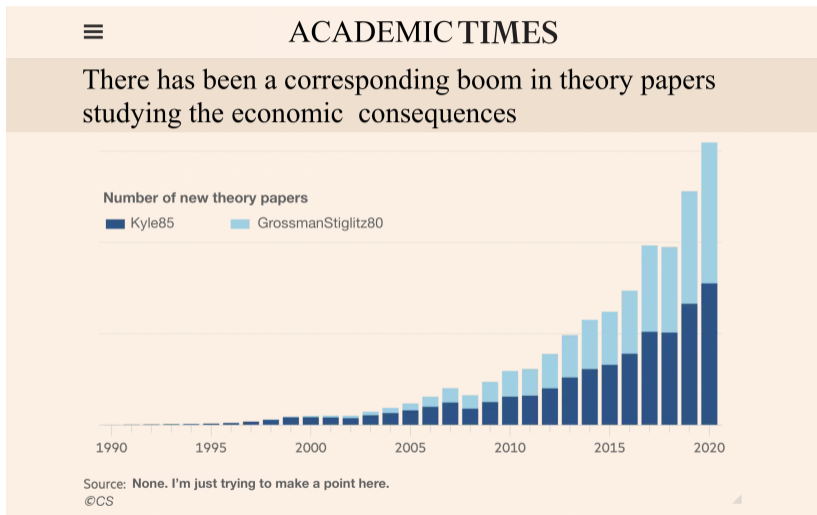
# Passive Ownership and Price Informativeness

Marco Sammon  
Harvard Business School  
March 24, 2022

Passive ownership has grown massively over the past 30 years and...



... so has the amount of academic research on passive ownership



# Outline

Passive Ownership and Price Informativeness

Excess Reconstitution-Day Volume (joint with Alex Chinco)

Conclusion

## Research Question

How does the increased importance of passive index funds affect stock price informativeness?

*“The inherent irony of the efficient market theory is that the more people believe in it and correspondingly shun active management, the more inefficient the market is likely to become.” – Seth Klarman in the NYT*

No consensus answer among academics!

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## What is price informativeness?

**Intuition:** How well stock prices reflect information about firm “fundamentals”

How do we measure price informativeness?

- ▶ Past academic literature: Estimating theoretical models
- ▶ This paper: What would trading volume, returns and volatility look like *if* people had more/less information?
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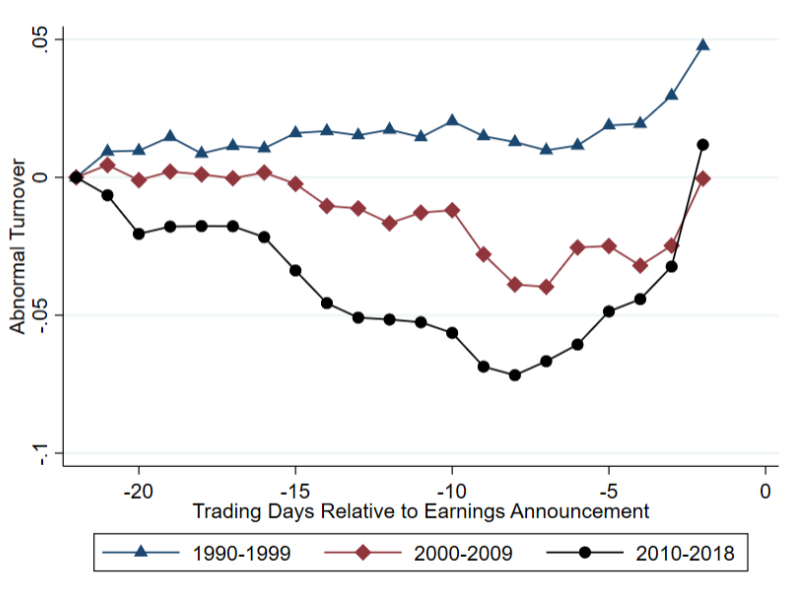
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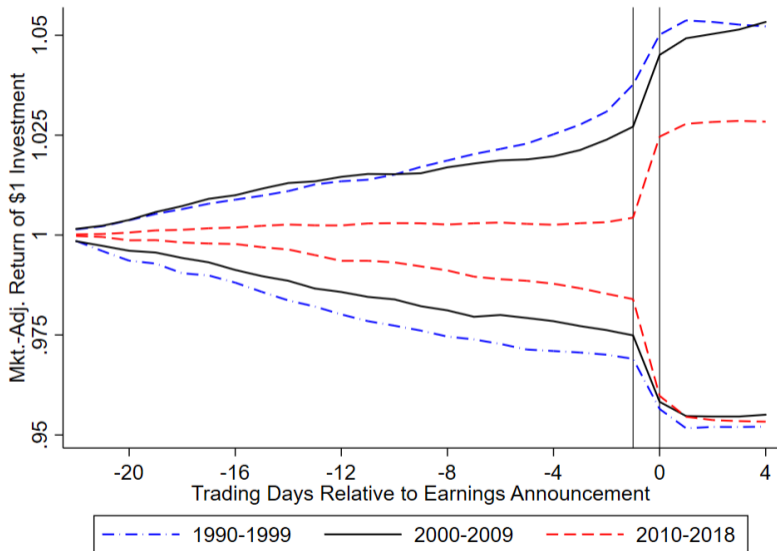
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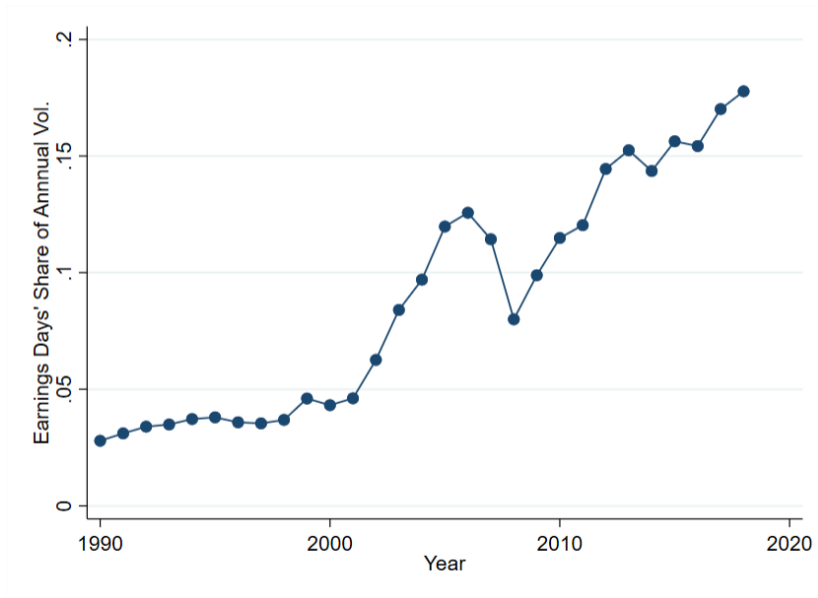
## Pre-Earnings Turnover has Declined



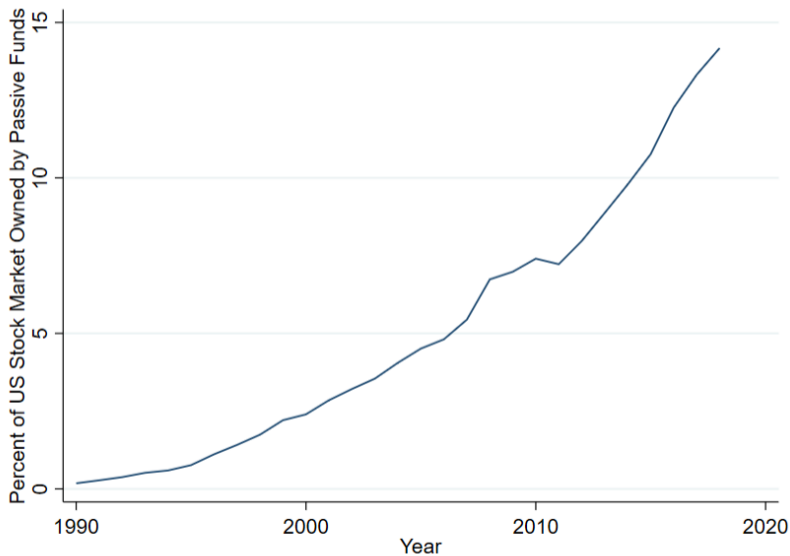
## Pre-Earnings Drift has Declined



## Earnings-Days' Share of Annual Volatility Has Increased



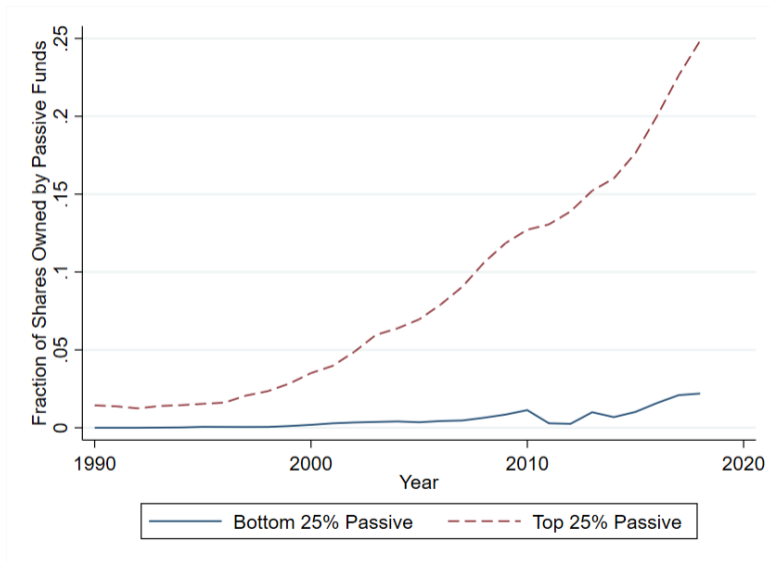
## Passive index funds and ETFs grew significantly over the same period



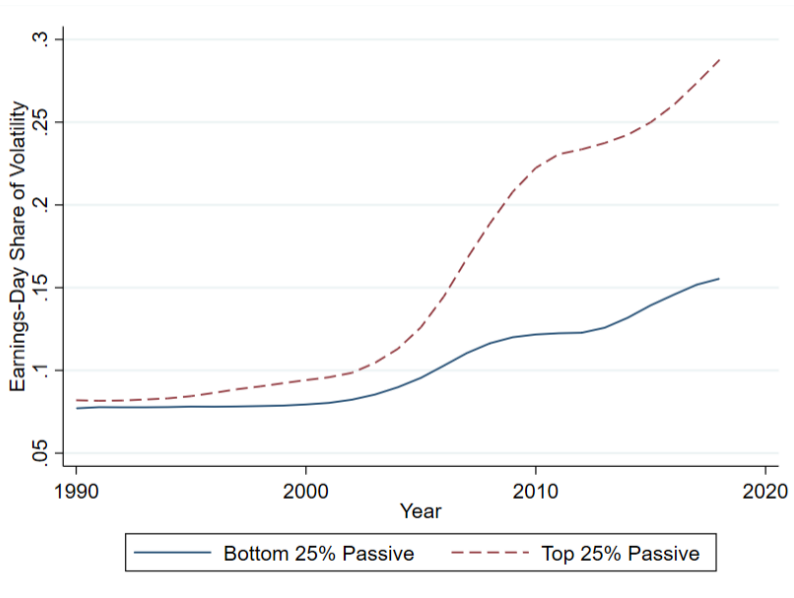


Are these common  
trends just a  
coincidence?

## Highest vs. Lowest 25% of Stocks by Passive Ownership



## High Passive $\Rightarrow$ More Earnings-Day Volatility



## Passive ownership huge factor in declining price informativeness

- ▶ 15% increase in passive  $\Rightarrow$   
Pre-earnings abnormal turnover declines by -1.7  
Avg. change from 1990s to 2010s:  $\approx -1.4$
- ▶ 15% increase in passive  $\Rightarrow$   
Pre-earnings drift declines by -0.7%  
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# What is the mechanism?

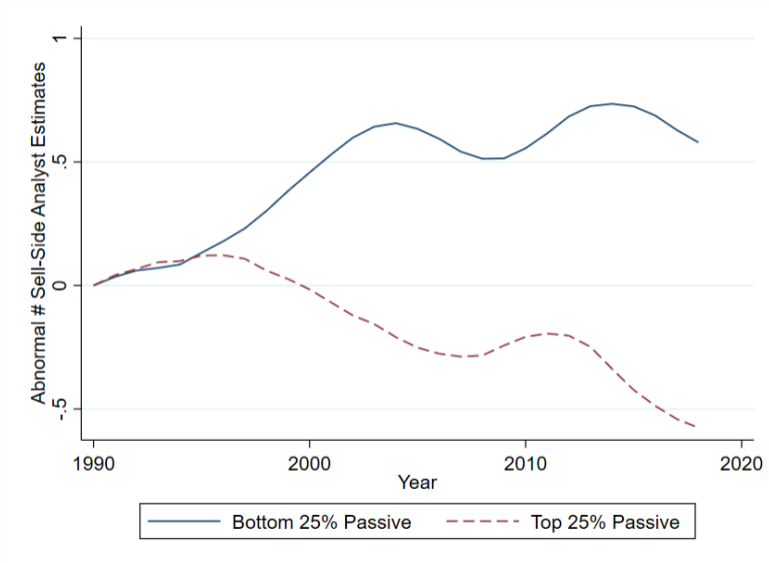
*“[Passive investing] does naturally focus more attention in a more macro direction, above the single security level... The more stock prices are set by trading in ETFs, the less important are what investors call ‘idiosyncratic factors’...” – WSJ*

# What is the mechanism?

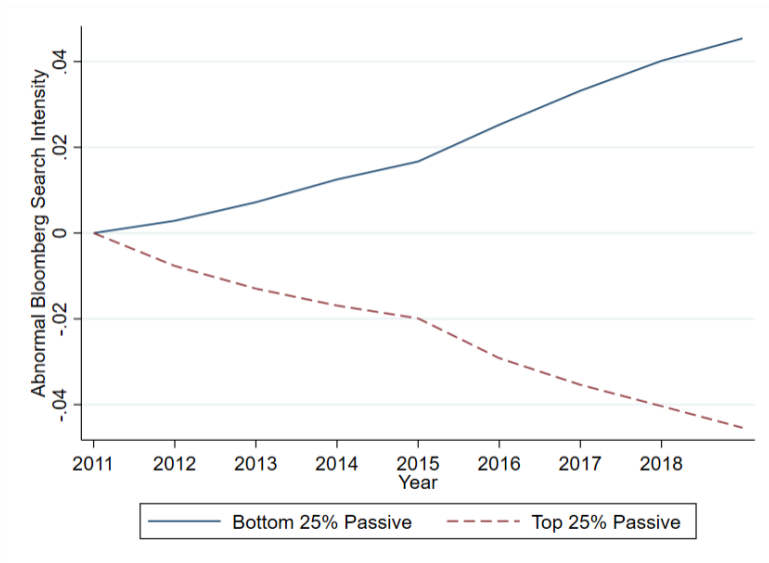
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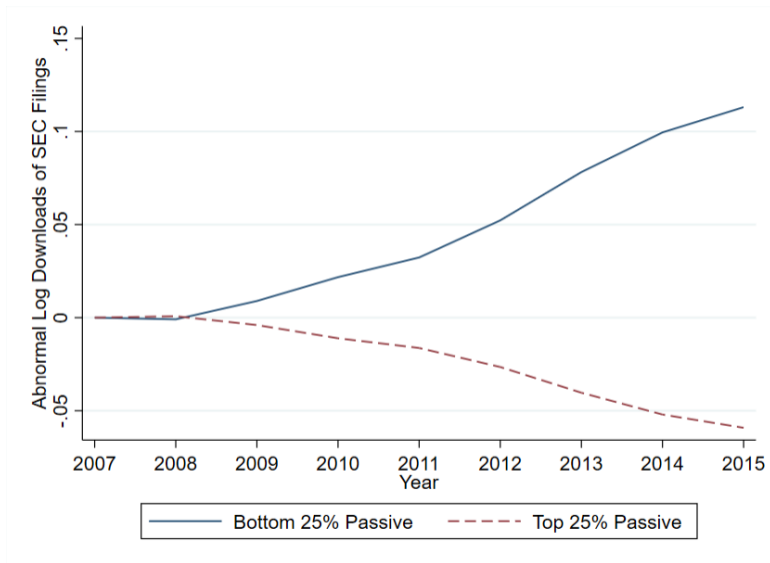
## More passive = fewer people paying attention



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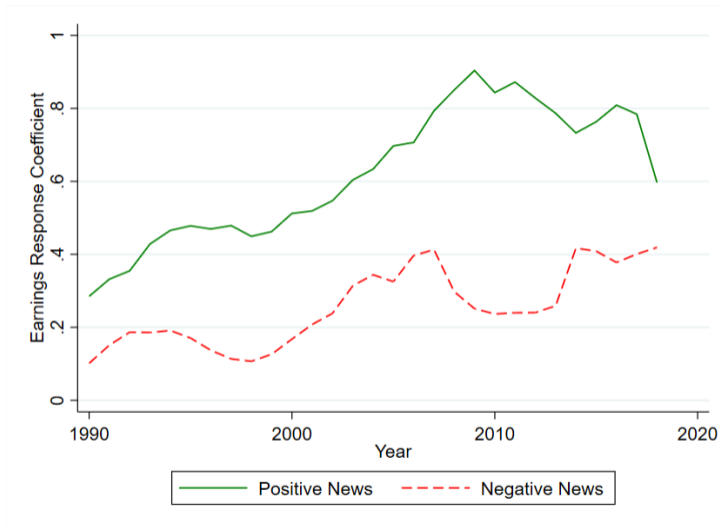


More passive = fewer people paying attention



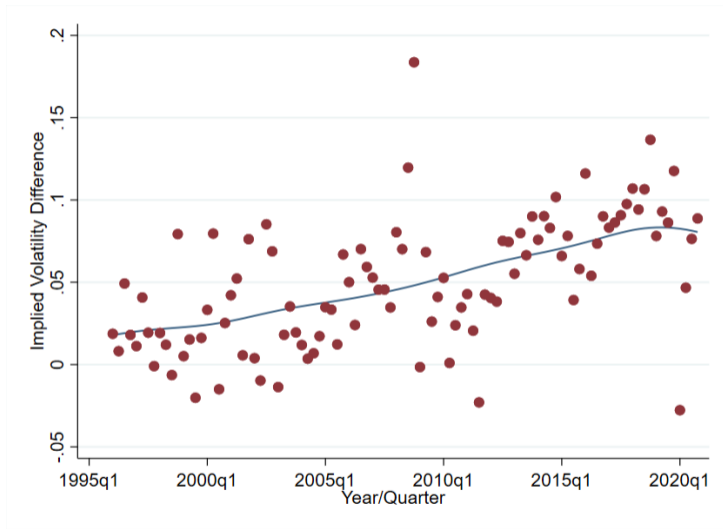
Can you make money  
on this?

## Response to earnings news has increased over time...



High passive stocks respond  $2\times$  as much to earnings news

... but options spanning earnings announcements became more expensive



About half the trend explained by rising passive ownership!

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# Russell reconstitution day large annual event for passive investing



June 18, 2021 · 2:20 PM EDT

Last Updated 8 months ago

Business

## Investors brace for annual Russell index rebalancing with pandemic imprint

By Chuck Mikolajczak

5 minute read



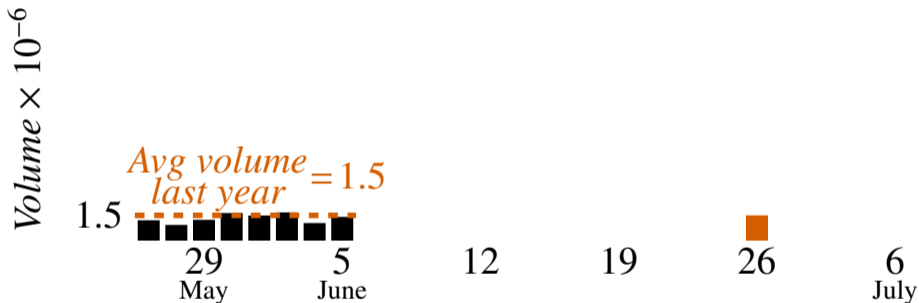
*“Let’s face it, for the New York Stock Exchange - Russell reconstitution, from a trading standpoint, is the greatest show on earth, that’s where it all comes down”*  
Gordon Charlop, managing director at Rosenblatt Securities



## One example from 2020: Lumentum Holdings

- ▶ June 5th, 2020: Preliminary add/drop list announcement
- ▶ June 26th, 2020: Russell reconstitution day
  - ▶ Timing known in advance!
- ▶ Lumentum would move from the 2000 to the 1000

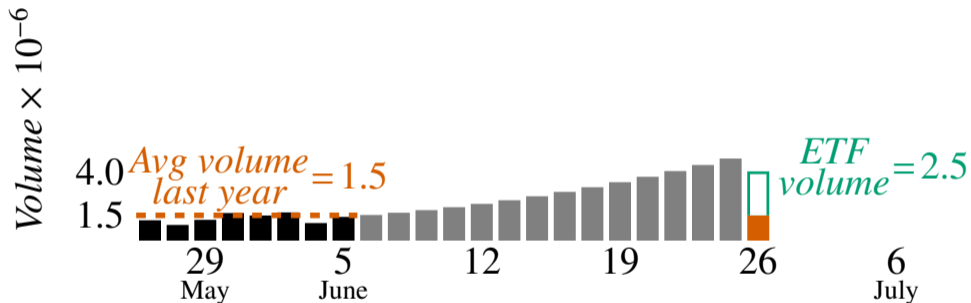
Lumentum had an average of 1.5m shares/day traded over the past year



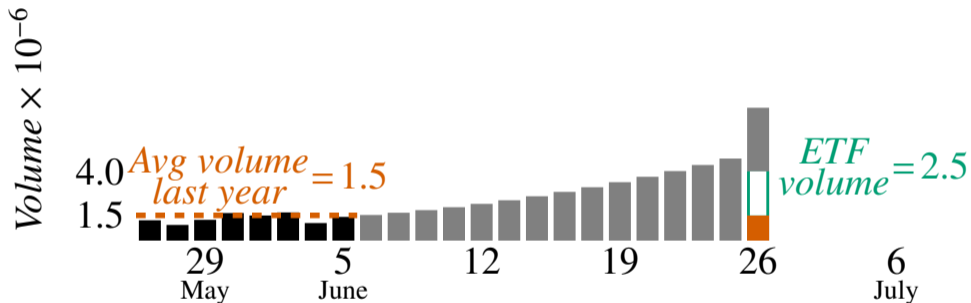
## Russell ETFs need to trade 2.5m shares



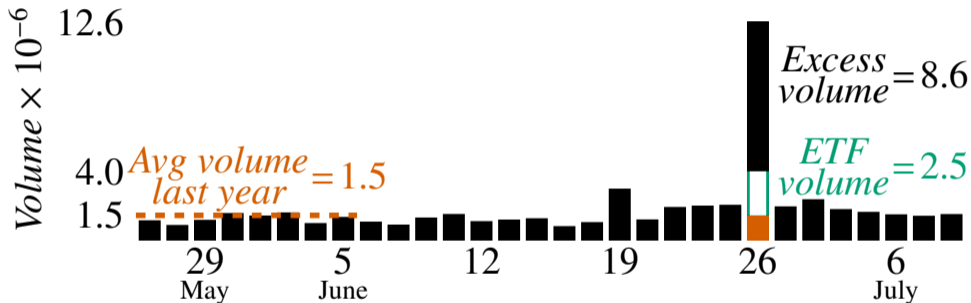
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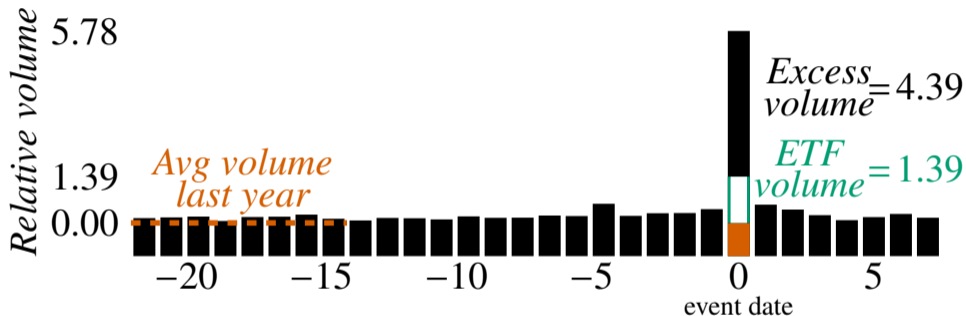
## Russell ETFs need to trade 2.5m shares



But, an additional 8.6m shares traded on the reconstitution day!

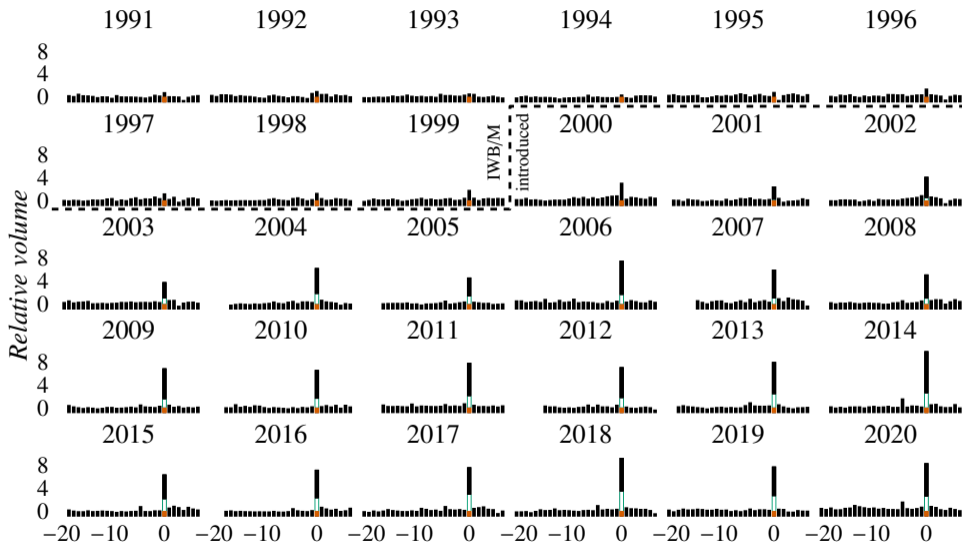


## Lumentum is rule rather than exception



**Notes:** Relative volume = 0 when volume on day  $t$  is equal to a stock's average daily volume over the past year. All Russell switchers, 2001-2020.

## Excess reconstitution day volume seems related to ETFs

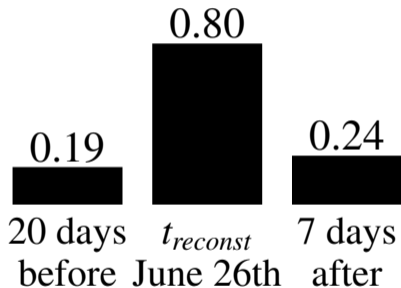




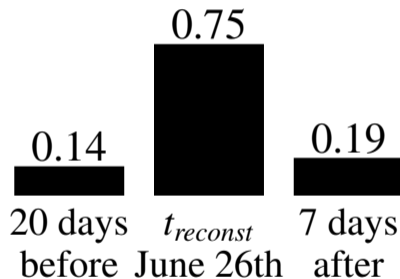
Is this all driven by  
hot-potato trading?

If all trading is at close, when do we play hot potato?

Pr[ *executed in final minute* ]



Pr[ *executed at market close* ]



# Just misclassifying Russell funds?

Maybe, but then need 11.5% of Russell 3000 owned by **strict** indexers and 0% owned by **weak** indexers

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## Key Findings

- ▶ Price informativeness declined over the past 30 years; passive ownership important driver of this decline
- ▶ Excess trading on Russell reconstitution day suggests ETFs have effects on markets that we (*read: academics*) don't fully understand

## So what?

- ▶ Passive ownership is making markets less efficient
  - ▶ Why? Leads fewer people to gather stock-specific fundamental information
  - ▶ Seems like there is money on the table, but increased uncertainty is priced in options and... *“Markets can stay irrational longer than you can stay solvent”*
- ▶ This may just be the tip of the iceberg – Russell reconstitution suggests passive ownership has many unintended effects on financial markets

# Appendix

# Data

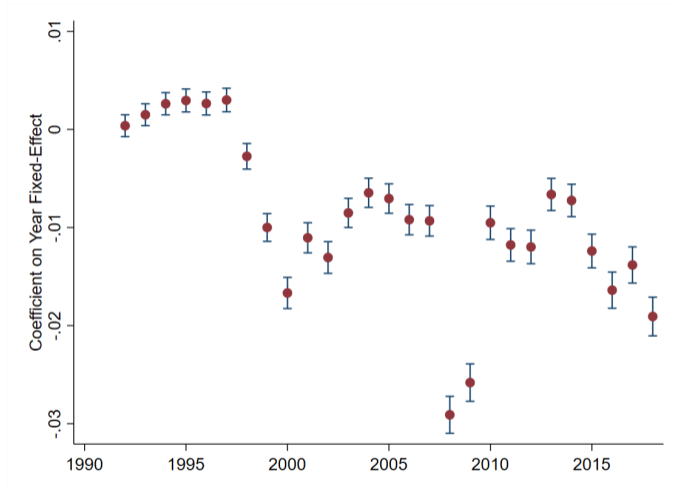
Sample: All ordinary common shares traded on major US exchanges; 1990-2018;  
non-missing earnings announcement dates

- ▶ CRSP
  - ▶ Returns, trading volume, volatility
  - ▶ Fund classification
- ▶ IBES
  - ▶ Earnings announcement date/time, analyst forecasts
- ▶ Thompson Reuters
  - ▶ Holdings of mutual funds and institutional investors
- ▶ Compustat
  - ▶ Index membership, firm fundamentals

[back](#)



## Pre-Earnings Drift Has Declined



**Notes:** Each dot represents the coefficient on a year fixed-effect in a pooled regression across all years. Bars represent 95% confidence intervals with standard errors clustered at the firm level. Regression includes firm fixed-effects. [back](#)

## Why Does Drift Need to be Asymmetric?

Lower drift  $\Rightarrow$  less informative prices

Example:  $r_{(t-22,t-1)} = -1\%$  and  $r_{(t-22,t)} = -5\%$

$$\frac{1+r_{(t-22,t-1)}}{1+r_{(t-22,t)}} = 0.99/0.95 > 1 \text{ (wrong way)}$$

$$\frac{1+r_{(t-22,t)}}{1+r_{(t-22,t-1)}} = 0.95/0.99 < 1 \text{ (right way)}$$

[back](#)

## Drift Examples

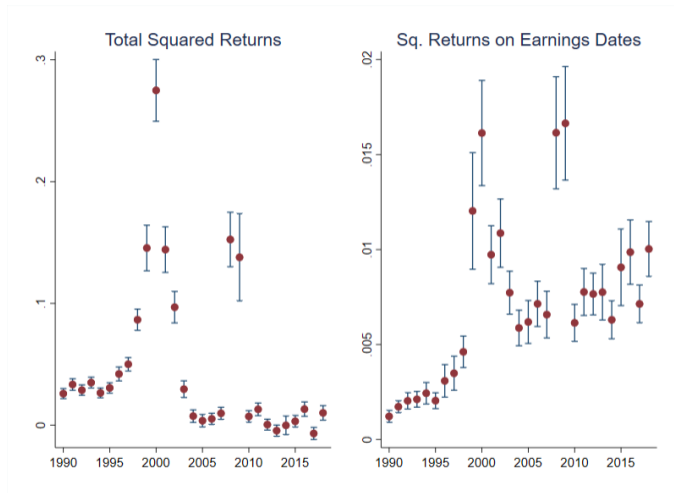
$$Drift_{it} = \begin{cases} \frac{1+r_{(t-22,t-1)}}{1+r_{(t-22,t)}} & \text{if } r_t > 0 \\ \frac{1+r_{(t-22,t)}}{1+r_{(t-22,t-1)}} & \text{if } r_t < 0 \end{cases}$$

$r_{t-22,t-1}$	$r_{t-22,t}$	$r_t$ sign	intuition	$Drift_{i,t}$	$\frac{(1+r_{t-22,t-1})}{(1+r_{t-22,t})}$
4%	5%	positive	most info.	0.99	0.99
1%	5%	positive	less info.	0.96	0.96
-1%	5%	positive	least info.	0.94	0.94
-4%	-5%	negative	most info.	0.99	1.01
-1%	-5%	negative	less info.	0.96	1.04
1%	-5%	negative	least info.	0.94	1.06

## Why Stock Prices Matter

- ▶ Chen, Goldstein and Jiang (2006): Firm managers learn about own firm from stock prices, use for investment decisions
- ▶ Dow, Goldstein and Guembel (2017): Investors incentives to gather information changes when firms condition investment decisions on stock prices; leads to a positive feedback effect
- ▶ Edmans et. al. (2012): Evidence that prices matter for takeovers, and thus can discipline managers through threats
- ▶ Goldstein and Guembel (2007): Allocation role of stock prices
- ▶ Dow and Rahi (2003): Welfare effects of informative prices
- ▶ Dow and Gorton (1997): Stock market can guide investment by conveying information about investment opportunities
- ▶ Berk, van Binsbergen and Liu (2017): Firms reward managers by giving the more capital

# Decomposition of Earnings-Day Volatility



**Notes:** Each dot represents the coefficient on a year fixed-effect in a pooled regression across all years. Bars represent 95% confidence intervals with standard errors clustered at the firm level. Regression includes firm fixed-effects. [Back](#)

## Cross-Sectional Regression Setup

$$Outcome_{i,t} = \alpha + \beta Passive_{i,t} + \gamma X_{i,t} + \phi_t + \psi_i + e_{i,t}$$

- ▶ Firm fundamentals: Age, market capitalization, returns from  $t - 12$  to  $t - 2$ , book-to-market ratio and total institutional ownership
- ▶ Firm risk measures: CAPM beta, CAPM R-squared, total volatility and idiosyncratic volatility
- ▶ Fixed effects: Firm, year-quarter
- ▶ Standard errors: Double clustered at the firm-year/quarter level
- ▶ Sample: All ordinary common shares traded on major exchanges, 1990-2018

Data sources

## Passive Correlated with Decreased Pre-Earnings Turnover

	(1)	(2)	(3)	(4)	(5)
Passive Ownership	-12.86***	-12.19***	-11.49***	-8.658***	-10.25***
	(2.956)	(2.969)	(3.207)	(2.900)	(2.768)
Observations	428,393	407,283	407,283	407,283	407,283
R-Squared	0.06	0.061	0.082	0.144	0.145
Firm + Year/Quarter FE	✓	✓	✓	✓	✓
Matched to Controls		✓	✓	✓	✓
Firm-Level Controls			✓		✓
Weight	Equal	Equal	Equal	Value	Value

15% inc. passive  $\Rightarrow$  pre-earnings abnormal turnover declines by -1.7

Avg. change from 1990s to 2010s:  $\approx$  -1.4

## Passive Correlated with Decreased Pre-Earnings Drift

	(1)	(2)	(3)	(4)	(5)
Passive Ownership	-0.0430*** (0.006)	-0.0468*** (0.006)	-0.0480*** (0.006)	-0.0528*** (0.016)	-0.0489*** (0.012)
Observations	492,024	448,625	448,625	448,625	448,625
R-Squared	0.199	0.205	0.22	0.26	0.276
Firm + Year/Quarter FE	✓	✓	✓	✓	✓
Matched to Controls		✓	✓	✓	✓
Firm-Level Controls			✓		✓
Weight	Equal	Equal	Equal	Value	Value

15% inc. passive  $\Rightarrow$  pre-earnings drift declines by -0.007

Avg. change from 1990s to 2010s:  $\approx$  -0.014



## Passive Correlated with Decreased QVS

	(1)	(2)	(3)	(4)	(5)
Passive Ownership	-0.538***	-0.505***	-0.395***	-0.253**	-0.324***
	(0.026)	(0.027)	(0.031)	(0.108)	(0.091)
Observations	495,316	450,152	450,152	450,152	450,152
R-Squared	0.214	0.218	0.22	0.233	0.234
Firm + Year/Quarter FE	✓	✓	✓	✓	✓
Matched to Controls		✓	✓	✓	✓
Firm-Level Controls			✓		✓
Weight	Equal	Equal	Equal	Value	Value

15% inc. passive  $\Rightarrow$  *QVS* declines by -5.9%

Avg. change from 1990s to 2010s:  $\approx$  -15%

## S&P 500 Index Additions

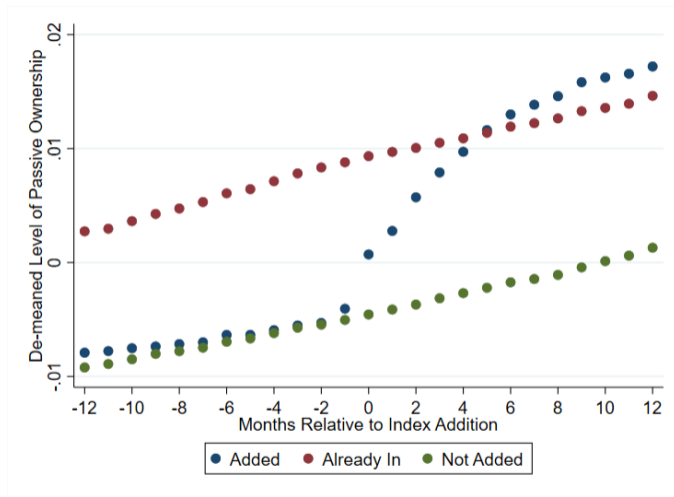
According to S&P: *“Stocks are added to make the index representative of the U.S. economy, and is not related to firm fundamentals.”*

Treated firms: Those added to the S&P 500 index

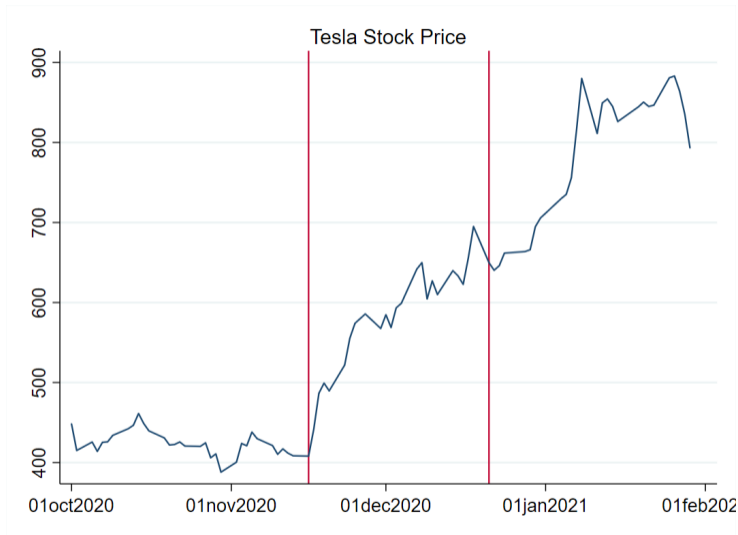
Two groups of control firms:

1. Same SIC-3 industry, same industry market cap. quintile, not in the index
2. Same SIC-3 industry, same industry market cap. quintile, already in the index

## S&P 500 Index Addition: Change in Passive Ownership



# Tesla: S&P 500 Index Addition Announced 11/16, Actually Added 12/21



**Notes:** First red line – announced that Tesla would be added to the S&P 500. Second red line – Tesla actually added.

# S&P 500 Regression Setup

Two IV approaches:

- ▶ Using  $Treated_{i,t}$  as an instrument for  $Passive_{i,t}$
- ▶ Using the difference in passive ownership between the two groups of control firms in quarter  $t - 1$ , interacted with  $Treated_{i,t}$  an instrument for  $Passive_{i,t}$

Details:

- ▶ *FE*: firm-cohort and month-of-index-addition
  - ▶ Cohort is defined as each month-of-index-addition, SIC 3 industry, market capitalization quintile group
- ▶ Timing: Five years of earnings announcements before/after index addition, excluding quarters between  $t - 1$  and  $t + 1$
- ▶ Years: 1992 to 2017

# S&P 500 Index Addition Decreases Price Informativeness

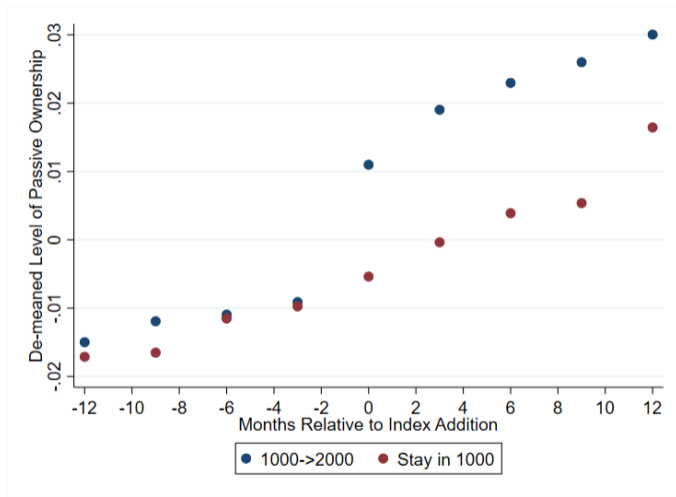
	Panel A: Binary Instrument			
	First Stage	Volume	Drift	QVS
Post x Treated	0.0127*** (0.001)			
Passive Ownership		-14.72* (7.440)	-0.131*** (0.038)	-1.902*** (0.138)
Observations	280,253	280,253	284,094	286,053
F-statistic	305			
	Panel B: Cont. Instrument			
	First Stage	Volume	Drift	QVS
Post x Treated x Passive Gap	0.536*** (0.050)			
Passive Ownership		-14.75** (7.404)	-0.129*** (0.037)	-1.895*** (0.138)
Observations	280,253	280,253	284,094	286,053
F-statistic	410			
Baseline Estimate		-11.49	-0.048	-0.395

**Notes:** First stage is from the *Volume* regression. Standard errors double clustered at the security-year/quarter level.

## Russell 1000/2000 Index Reconstitution

- ▶ The Russell 1000 and 2000 are value-weighted indexes containing the 1000 and next 2000 largest US stocks
- ▶ In 2007 Russell switched to a bandwidth rule to reduce turnover between indices
  - ▶ To switch from the 1000 to the 2000, your market capitalization needs to be below the market capitalization of the 1000th ranked firm by more than 2.5% of the Russell 3000E's total capitalization
- ▶ Treated Group: Firms in the 1000 in year  $t - 1$  within  $\pm 100$  ranks of the lower threshold that switch to the 2000 in year  $t$
- ▶ Control group: Firms in the 1000 in year  $t - 1$  within  $\pm 100$  ranks of the lower threshold that don't switch to the 2000 in year  $t$

## Russell 1000/2000 Rebalancing: Change in Passive Ownership





# Russell Regression Setup

Two IV approaches:

- ▶ Using  $Treated_{i,t}$  as an instrument for  $\Delta Passive_{i,t}$
- ▶ Using the difference in passive ownership between 1000 and 2000 firms within 100 ranks of cutoff at  $t - 1$ , interacted with  $Treated_{i,t}$  an instrument for  $Passive_{i,t}$

Details:

- ▶ *FE*: firm-cohort and month-of-index-addition
  - ▶ Cohort is defined by month-of-index-addition, as Russell only rebalances the indices once per year
- ▶ Timing: Five years of earnings announcements before/after index addition, excluding quarter  $t - 1$  to  $t + 1$ .
- ▶ Years: 2007 to 2019

## Switching Decreases Price Informativeness

	First Stage	Panel A: Binary Instrument		QVS
		Volume	Drift	
Post x Treated	0.0104** (0.005)			
Passive Ownership		-20.12*** (6.652)	-0.0922*** (0.031)	-0.380*** (0.120)
Observations	9,348	9,348	9,811	9,823
F-statistic	143			
	First Stage	Panel B: Cont. Instrument		QVS
		Volume	Drift	
Post x Treated x Passive Gap	0.786*** (0.227)			
Passive Ownership		-19.78*** (6.462)	-0.0931*** (0.031)	-0.380*** (0.120)
Observations	9,348	9,348	9,811	9,823
F-statistic	153			
Baseline Estimate		-11.49	-0.048	-0.395

**Notes:** First stage is from the *Volume* regression. Standard errors double clustered at the security/time level.

## Passive correlated with less information production by sell-side analysts

$$Outcome_{i,t} = \alpha + \beta Passive_{i,t} + \gamma X_{i,t} + \phi_t + \psi_i + e_{i,t}$$

	Num. Est (1)	SD(Est.) (2)	Dist./SD(Est.) (3)	Dist./P (4)	Updates (5)	Time (6)
Passive Ownership	-11.58*** (1.382)	0.721*** (0.172)	2.101*** (0.476)	0.204** (0.085)	-0.443*** (0.099)	0.345*** (0.106)
Observations	216,604	216,604	216,604	216,604	133,082	133,082
R-squared	0.789	0.644	0.124	0.259	0.255	0.549
Mean	8.624	0.0931	2.251	0.0261	2.233	3.765
St. Dev.	5.943	0.406	3.114	0.255	0.447	0.841

**Notes:** Distance is the absolute deviation of earnings from the last consensus estimate before the announcement date, divided by the earnings value, excluding observations where earnings is less than 1 cent in absolute value. Time is average days between each covering analyst's estimate updates. The *time* regression only includes stocks/years which have an analyst who updated their estimate at least once within the corresponding IBES statistical period. Downloads is total non-robot downloads from the SEC server log, and has a mean of 10.4.

## Passive correlated with fewer downloads of SEC filings

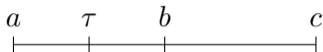
$$Downloads_{i,t} = \alpha + \beta Passive_{i,t} + \gamma X_{i,t} + \phi_t + \psi_i + e_{i,t}$$

	(1)	(2)	(3)	(4)	(5)
Passive Ownership	0.555*** (0.157)	-0.12 (0.170)	-1.135*** (0.198)	-0.572 (0.542)	-1.407** (0.653)
Observations	640,366	533,099	533,099	533,099	533,099
R-Squared	0.784	0.807	0.81	0.889	0.892
Firm + Year/Quarter FE	✓	✓	✓	✓	✓
Matched to Controls		✓	✓	✓	✓
Firm-Level Controls			✓		✓
Weight	Equal	Equal	Equal	Value	Value

**Notes:** Downloads is total non-robot downloads from the SEC server log in a given firm/month, and has a mean of 4.4.

## Constructing an ex-ante measure of earnings uncertainty

Following Kelly et. al. (2016):



- ▶ For firm  $i$ , on each trading day  $t$ , compute the equal-weighted average implied volatility across all at-the-money options expiring on date  $e$ ,  $IV_{i,t,e}$
- ▶ For expiration  $b$ , take an equal-weighted average of  $IV_{i,t,b}$  over the 20-day window before  $\tau$
- ▶ Define  $\overline{IV}_{i,a}$  and  $\overline{IV}_{i,c}$  as averages of  $IV_{i,t,e}$  over the 20-day windows that end  $b - \tau + 1$  days before  $a$  and  $c$

$$IVD_{i,\tau} = \overline{IV}_{i,b} - \frac{1}{2} (\overline{IV}_{i,a} + \overline{IV}_{i,c})$$

# Average ex-ante earnings uncertainty has increased



**Notes:** Red dots are average  $IVD_{i,\tau}$  by quarter. Blue line represents a LOWESS filter.

## Higher passive ownership $\Rightarrow$ more ex-ante earnings uncertainty

$$IVD_{i,t} = \alpha + \beta Passive_{i,t} + \gamma X_{i,t} + \phi_t + \psi_i + \zeta_q + e_{i,t}$$

	(1)	(2)	(3)	(4)	(5)
Passive Ownership	0.107*** (0.026)	0.126*** (0.028)	0.0958*** (0.029)	0.150*** (0.035)	0.171*** (0.033)
Observations	118,809	111,415	111,415	111,415	111,415
R-Squared	0.273	0.281	0.286	0.416	0.423
Firm + Year/Quarter FE	✓	✓	✓	✓	✓
Matched to Controls		✓	✓	✓	✓
Firm-Level Controls			✓		✓
Weight	Equal	Equal	Equal	Value	Value

**Notes:** Average *IVD* increased by about 0.1 between 1996 and 2020 (full-sample mean of 0.051).

## Earnings Response Regression

Baseline (Kothari and Sloan, 1992):

$$r_{i,t} = \alpha + \beta \times SUE_{i,t} + controls + \epsilon_{i,t}$$

Allowing for asymmetry between positive and negative surprises:

$$r_{i,t} = \alpha + \beta_1 \times SUE_{i,t} \times \mathbf{1}_{SUE_{i,t} > 0} + \beta_2 \times |SUE_{i,t}| \times \mathbf{1}_{SUE_{i,t} < 0} + controls + \epsilon_{i,t}$$

Further, can decompose earnings news into systematic and idiosyncratic components using the method in Glosten et al. (2016)



## Higher passive ownership $\Rightarrow$ more responsive to earnings news

$$r_{i,t} = \alpha + \beta_1 \times SUE_{i,t} + \beta_2 (SUE_{i,t} \times Passive_{i,t}) + controls + \epsilon_{i,t}$$

	(1)	(2)		(3)
SUE	0.00353*** (0.0002)		Pos Sys. SUE	0.00722*** (0.0021)
SUE x Passive	0.0118** (0.0047)		Neg Sys. SUE	-0.00362** (0.0015)
Pos. SUE		0.00709*** (0.0004)	Pos. Idio. SUE	0.00705*** (0.0003)
Neg. SUE		-0.00214*** (0.0002)	Neg. Idio. SUE	-0.00188*** (0.0002)
Pos. SUE x Passive		-0.00219 (0.0084)	Pos Sys. SUE x Passive	-0.023 (0.0183)
Neg. SUE x Passive		-0.0167*** (0.0037)	Neg Sys. SUE x Passive	0.012 (0.0212)
			Pos. Idio. SUE x Passive	-0.000312 (0.0085)
			Neg. Idio. SUE x Passive	-0.0178*** (0.0040)
Observations	412,596	412,596	Observations	412,596
R-squared	0.058	0.06	R-squared	0.06

**Notes:** Standard errors double clustered at the firm and year level. Same controls/fixed-effects as baseline cross-sectional regressions.