The Economic Consequences of Lower Retail Trading Costs

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Introduction

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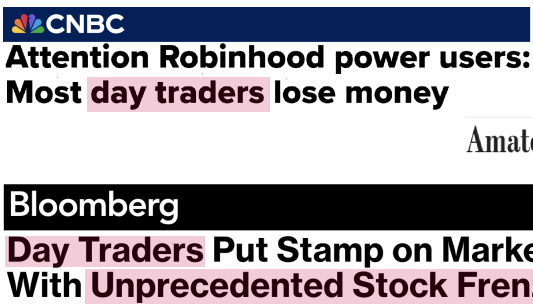
  - Lower trading costs incentivize more short-term speculation, such as day trading
- However, consequences for retail investors & markets **unclear**:



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SEC's Gensler says brokerage apps want users to trade frequently, which can be bad for small investors

EU warns brokers over fuelling 'speculative behaviour' by retail investors

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This paper: impact of increased speculation from cheaper trading on **retail investors** and **market**

This Paper

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  - Day trading: purchase and sale of the same stock within a day

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  - Targeted reform: **clean identification** for both investor responses and market impacts
- Using **detailed account-level transaction data**, we study:
  - Do retail investors benefit financially? (in terms of portfolio returns)
  - Does market quality improve or worsen?

Preview of Results

Q1: Do retail investors benefit financially? **No**

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- Volume response: Trading volume ↑, especially for **small** and **worse-performing** traders

  $\Rightarrow$ Losses ↑ by trading more (Net Return$'$ $\times$ ΔVolume < 0)

- Performance response

- Net impact on portfolio returns

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  ⇒ Realized benefit is less than expected since **attention** ↓ (ΔNet Return $\times$ Volume > 0)
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- Net impact on portfolio returns is **negative** because

$$\underbrace{\Delta\text{Net Return} \times \text{Volume}}_{\text{Realized benefit from lower tax } (+)} < \underbrace{\text{Net Return}' \times \Delta\text{Volume}}_{\text{Losses from increased trading } (-)}$$

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⇒ **Trade-off** of lower retail trading costs: individual financial losses vs. market benefits

Related Literature

Behavioral biases of retail investors: Barber and Odean (2000); Barber and Odean (2001); Barber and Odean (2008); Barber et al. (2007); Barber et al. (2009); Barber et al. (2022); Calvet, Campbell, and Sodini (2009); Dorn and Huberman (2005); Dorn and Sengmueller (2009); Engelberg and Parsons (2011); Gao and Lin (2015); Glaser and Weber (2007); Graham, Harvey, and Huang (2009); Grinblatt and Keloharju (2001); Grinblatt and Keloharju (2009); Odean (1998a); Odean (1998b); Seasholes and Wu (2007); Gabaix (2014); Gargano and Rossi (2018); Gabaix (2019); Birru et al (2023).

Retail investing in zero-commission era: Barber et al. (2022); Bryzgalova, Pavlova, and Sikorskaya (2023); de Silva, Smith, and So (2023); Eaton et al. (2022); Even-Tov et al. (2022); Fedyk (2021); Kalda et al. (2021); Ozik, Sadka, and Shen (2021); Welch (2022).

Impact of financial transaction taxes: Baltagi, Li, and Li (2006); Becchetti, Ferrari, and Trenta (2014); Capelle-Blancard (2017); Capelle-Blancard and Havrylchyk (2016); Cappelletti et al. (2017); Chou and Wang (2006); Colliard and Hoffmann (2017); Deng, Liu, and Wei (2018); Gomber et al. (2016); Hu (1998); Hvozdyk and Rustanov (2016); Jones and Seguin (1997); Liu and Zhu (2009); Phylaktis and Aristidou (2007); Pomeranets and Weaver (2018); Roll (1989); Sahu (2008); Saporta and Kamhon (1997); Umlauf (1993).

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$\Rightarrow$ Isolate market impact of retail day traders (noise traders) & document the trade-offs

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Roadmap

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Background & Empirical Strategy

Investor Responses (Volume & Performance)

Financial Impact on Investors

Market Impact

Conclusion

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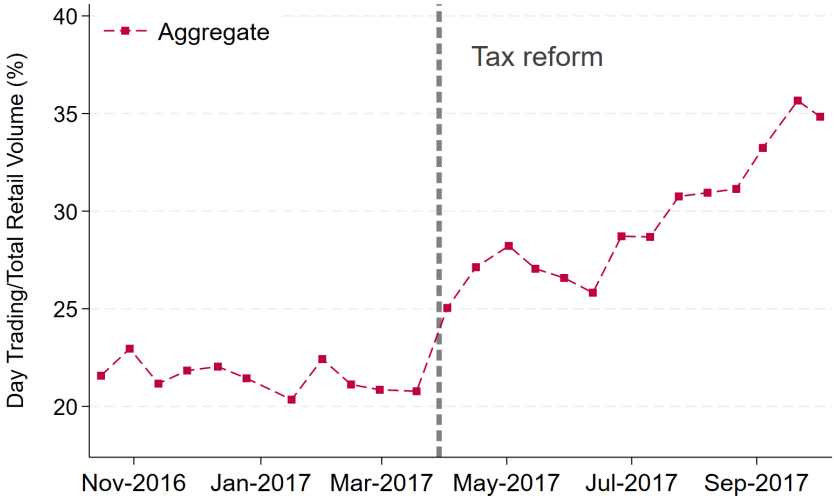
- Data: **Account-level transaction data** from a major brokerage firm in Taiwan
  - Covers 4.5% of all trades
  - Demographics and acct. characteristics similar to classic studies, e.g. Barber and Odean (2000)
  - **Analysis sample** period: **6-month window** around the tax reform

Coverage | Comparison w/ Barber et al (2009, 2019) | Other brokerage sample | Realized rate | Day trading across countries

Share of Day Trading Volume



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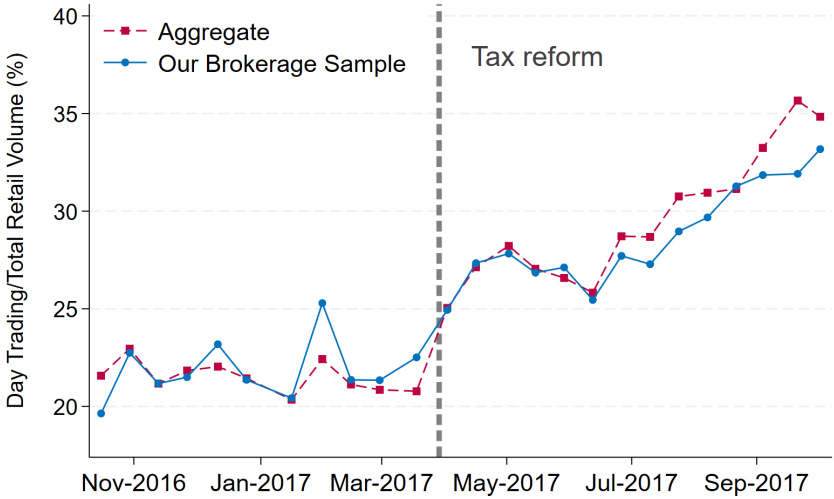
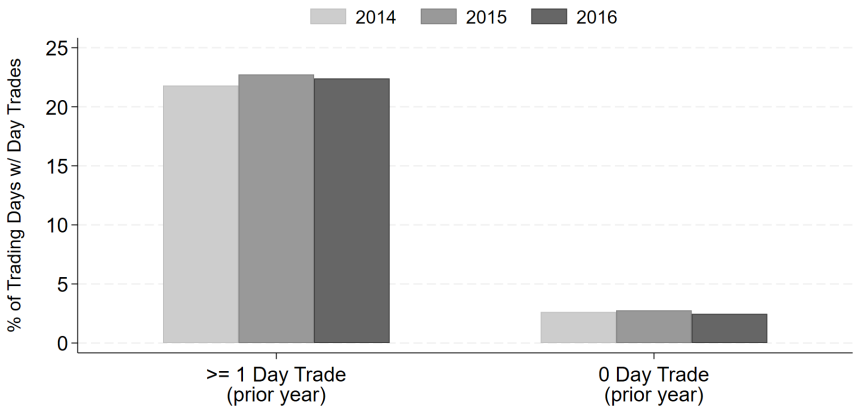


Empirical Strategy for Individual-Level Effects

Day trading behavior is **persistent** & **heterogeneous** across investors

- Day trading frequency higher among those with prior day trading experience (≥ 1 day trade)



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- **DiD intuition:** behavior of active non-day traders serves as counterfactual for day traders

Sum. stats Non-day traders

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Specification for Estimating Volume Response

For volume, assume **parallel trends (PT)** in percentage terms. That is, without tax reform,

$$\%\text{ change in day-trade volume by treatment} = \%\text{ change in total volume by control}$$

i.e. **respond comparably** to changes in market conditions

Justification Day-trade prob. in reform year

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Estimate volume responses using Poisson quasi-maximum likelihood estimators (QMLE)

$$\text{Volume}_{it} = \exp(\beta\ \text{Treat}_i \times \text{Post}_t + \delta_i + \gamma_t)\varepsilon_{it}$$

- Volume_{it}: trading volume by individual i in bi-weekly interval t
  - Day trades for treatment
  - All trades for control
- Accounts for zero trading volumes and aligns with PT assumption
  (Wooldridge 2023; Chen and Roth 2024)
- β: effect of tax reform on day trading volume (in percentage terms)

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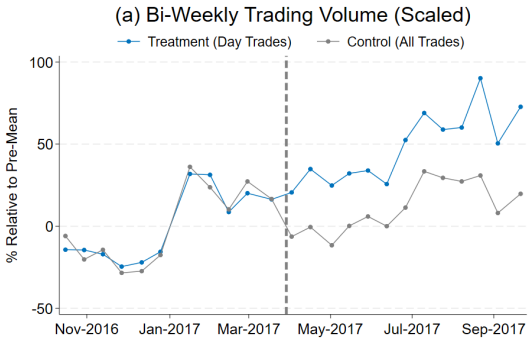
Day-Trade Volume Response



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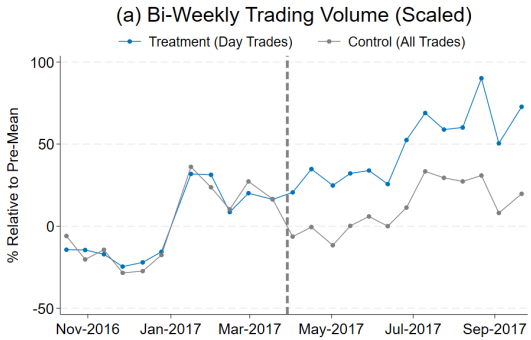
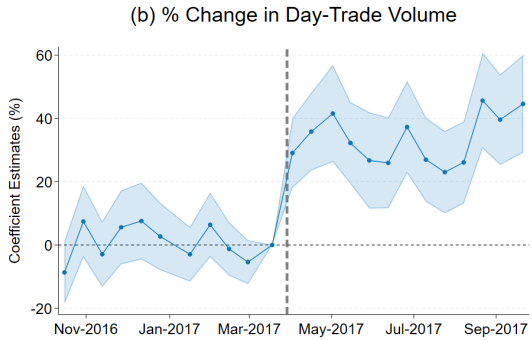
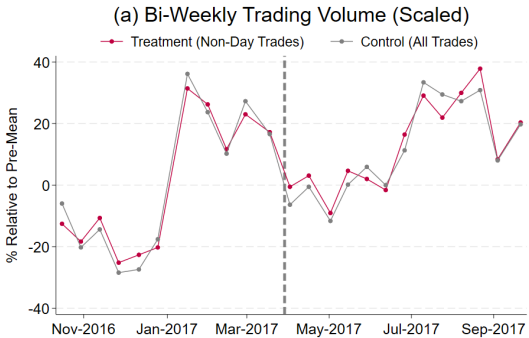


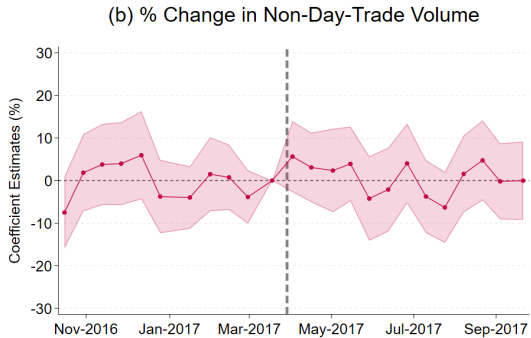


- Day-trade volume increases by **30%** due to tax reform ($\approx$ +\$7500/month)

DiD estimates | All vs All | Control sensitivity | New trades | # monthly trades | Stock correlation | Extensive margin

Non-Day-Trade Volume





- Suggests the reform specifically affects day trading behavior

Heterogeneity in Trading Volume Responses

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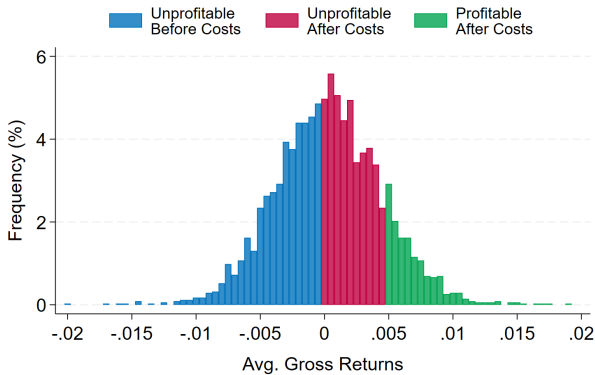
- How do trading responses differ by investor sophistication?
  - Measured by **portfolio size** and **past performance**
- Important since the impact on individuals and markets depends on who responds more
  - e.g more positive if increased trading driven mostly by sophisticated investors

Defining Skill of Day Traders

Among those who **day traded** $\geq$ **30 days** during the classification period (Barber et al. 2020)

- Profitable after costs: avg. gross returns $>$ total transaction costs (tax + commissions)
- Unprofitable after costs: avg. gross returns $\in$ [0, total transaction costs]
- Unprofitable before costs: avg. gross returns $<$ 0 bps



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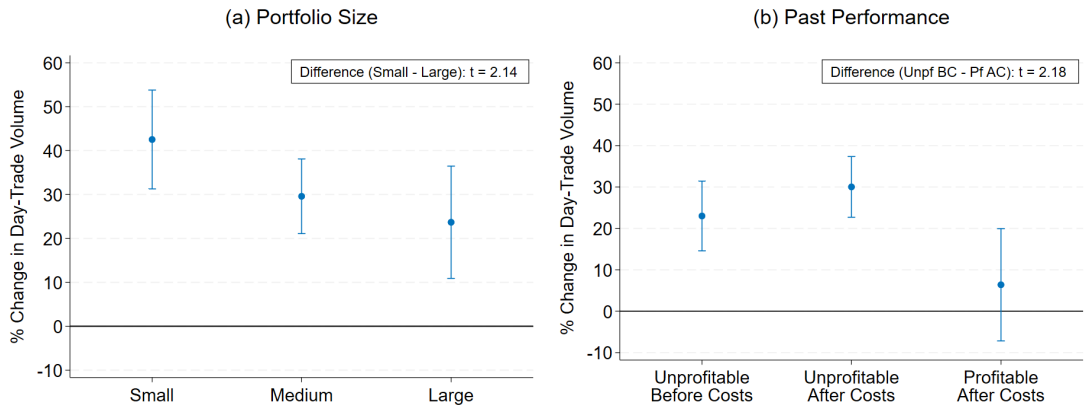
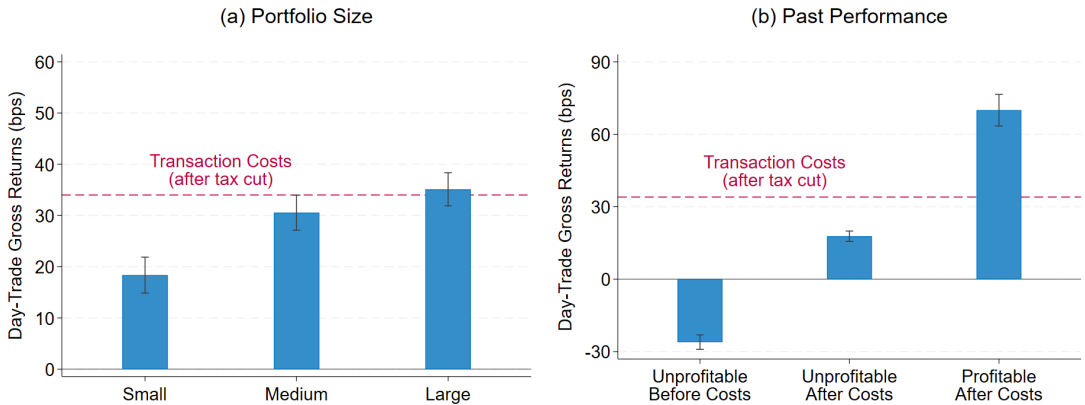


- Lower costs disproportionately encourage trading by less sophisticated traders

Parallel trends for size | Parallel trend for skill | DiD estimates

Why Heterogeneity Matters

Average gross returns per $ day-traded pre-reform:



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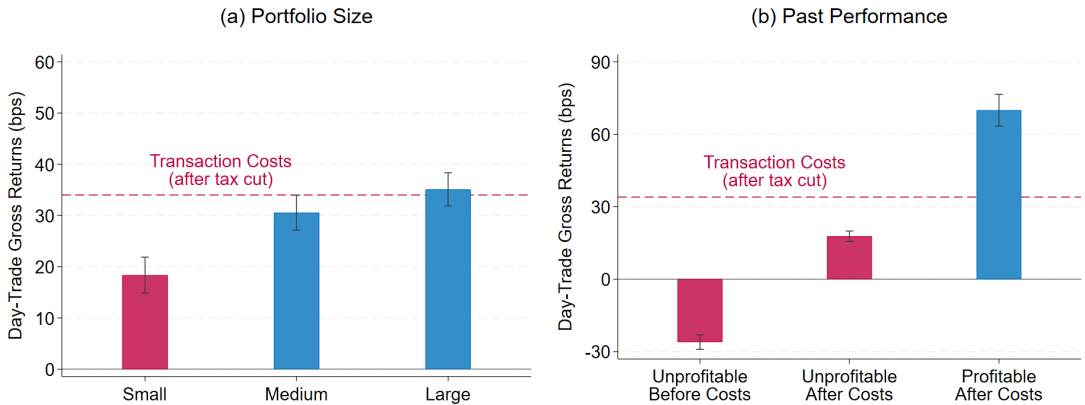

- Increased trading by less sophisticated traders $\Rightarrow$ losses $\uparrow$ (Net Return$'$ $\times$ ΔVolume < 0)

Predictive power of size

Performance Response

$$\Delta\text{Net Profit} = \underbrace{\Delta\text{Net Return}}_{?} \times \text{Volume} + \underbrace{\text{Net Return}' \times \Delta\text{Volume}}_{-}$$

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  - Investors still better off if realized tax cut benefit covers additional losses from increased trading

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- How much improvement in net returns **per $ traded** is realized?
  - Investors still better off if realized tax cut benefit covers additional losses from increased trading
- Specifically, look at how **gross returns per $ traded** change

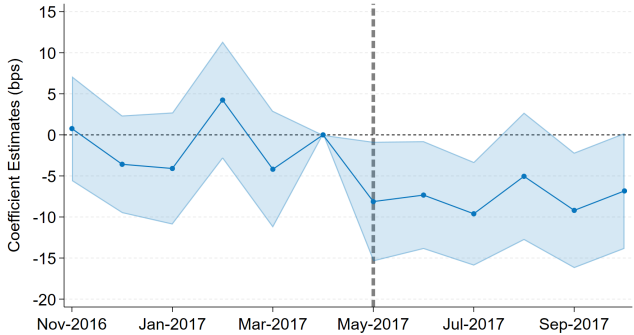
$$\text{Gross returns}_{it} = \beta\ \text{Treat}_i \times \text{Post}_t + \delta_i + \gamma_t + \varepsilon_{it}$$

  - Gross returns$_{i,t}$: returns per $ traded on day t by investor i (before transaction costs)
  - Computed from day trades for treatment, all trades for control
- If gross returns **remain unchanged** (e.g. day traders maintain existing strategies on average)

  $\Rightarrow$ Enjoy 15-basis-point increase in net returns after tax cut

$$\underbrace{\Delta\text{Net Return}}_{\text{Realized benefit}} = \underbrace{15\text{ bps}}_{\text{Tax Cut}} - \underbrace{\Delta\text{Gross Return}}_{\text{Performance response}}$$

Effect on Trading Performance



- Gross returns from day trading decrease by **5.3 bps**
- Represents **15% decline** in performance (average per-dollar gross returns is $\sim$30 bps)
- Net returns increase only by 10 bps post-reform ($= 15 - 5$) $\rightarrow$ traders benefit, but less than expected

Against market | DiD estimates | All vs All | Non-day vs All | Heterogeneity | New trades | Holding period

Why Trading Performance Deteriorates?

- Increase in trading volume does not mechanically lead to lower per-dollar gross returns
  - $\Rightarrow$ Investors change **how** they trade and in the **wrong direction systematically**

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  - $\Rightarrow$ Investors change **how** they trade and in the **wrong direction systematically**
- One potential explanation relates to a widespread regulatory concern:
  - Reducing explicit costs $\rightarrow$ incentivizes **inattentive** behavior

"*ESMA emphasises that the marketing of the service as 'cost-free' [...] could incentivise retail investors' gaming or speculative behaviour due to the incorrect perception that trading is free.*"

— European Securities and Markets Authority (2021)

Why Trading Performance Deteriorates?

- Increase in trading volume does not mechanically lead to lower per-dollar gross returns
  - $\Rightarrow$ Investors change **how** they trade and in the **wrong direction systematically**
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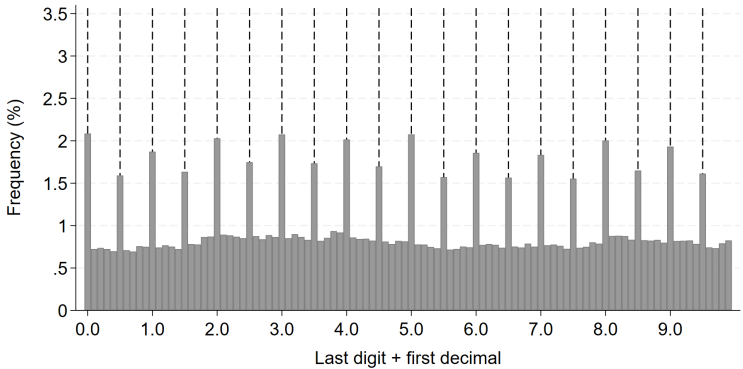
- Measure of cognitive shortcut usage: share of limit orders submitted at X.0 or X.5

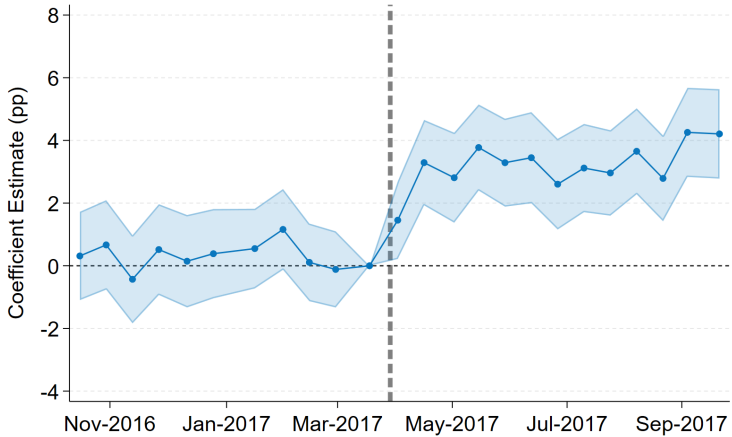


- Negatively correlates with sophistication & associated w/ worse performance within investors

Corr w ability Return on shortcuts

Effect on Cognitive Shortcuts Usage

$$\text{Share of Round-Number Orders}_{i,t} = \beta\ \text{Treat}_i \times \text{Post}_t + \delta_i + \gamma_t + \varepsilon_{i,t}$$



- Share of round-number orders increases by 2 pp (7% of mean) DiD estimates

Salience-Driven Trading

- Attention is scarce resource $\Rightarrow$ retail investors focus on trading salient stocks

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- Proxy salient events with **extreme overnight returns** (top 5% absolute returns)
- Define **propensity** to trade salient stocks for investor i on a given day t as

$$\text{Share of Salient Stocks Traded}_{i,t} := \frac{\text{Volume in stocks with extreme overnight returns } \textbf{[0,2] days ago}_{i,t}}{\text{Trading volume}_{i,t}}$$

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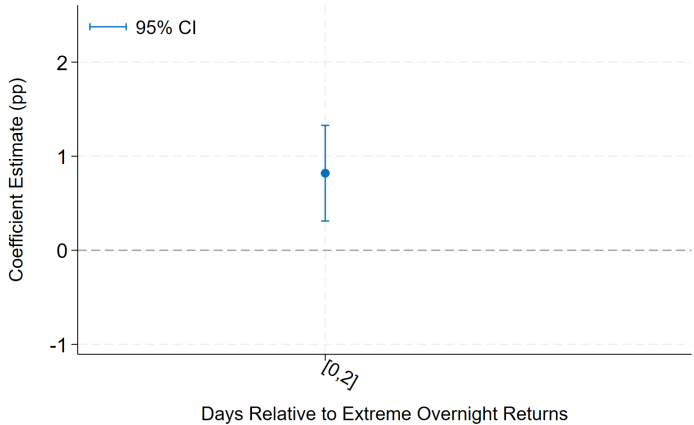

- Share of salient stocks traded increases by 0.8 pp (4% of mean)

Salience-Driven Trading

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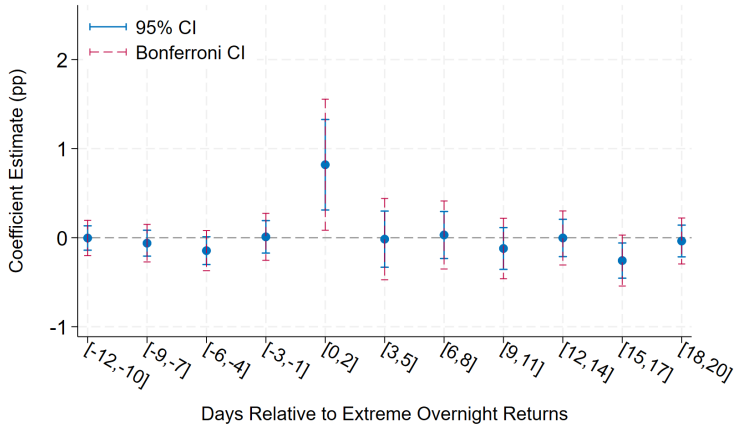

- Effect concentrated in stocks with **recent** extreme overnight returns ⇒ consistent with salience

Limit order effort By Bins

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Computing Financial Impact

- Tax cut + investor responses $\rightarrow$ Do day traders **benefit financially** from tax cut?
  - Not obvious

$\Rightarrow$ Net returns per \$ traded $\uparrow$ but trading $\uparrow$ driven by less sophisticated generates additional losses

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- **Impact on portfolio returns from day trading** ($\boldsymbol{\Delta PR}$) within portfolio size tercile g:

$$\mathbb{E}_g[\Delta PR] = \mathbb{E}_g\left[\frac{\Delta\text{Net profit}}{\text{Portfolio Size}_{\text{pre}}}\right] = \mathbb{E}_g\left[\frac{\Delta\ (\text{Day-Trade Volume} \times \text{Net return})}{\text{Portfolio Size}_{\text{pre}}}\right]$$

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$$+ \mathbb{E}_g\left[\frac{\text{Net return}_{\text{post}}}{\text{Portfolio Size}_{\text{pre}}}\right] \times \underbrace{\mathbb{E}_g[\Delta\text{Day-Trade Volume}]}_{\text{Volume Response in \$}}$$

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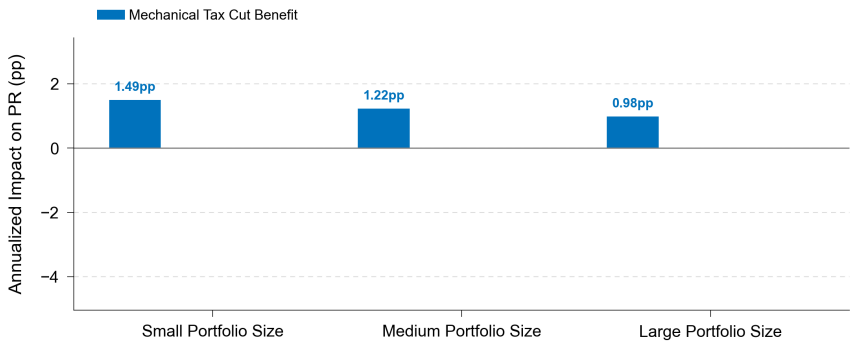
- Then, impact on the average day trader is

$$\mathbb{E}[\Delta PR] = \sum_g s_g \, \mathbb{E}_g[\Delta PR]$$

where s_g is the population share of group g.

Decomposing Financial Impact

$$\mathbb{E}_g[\Delta PR] \approx \underbrace{\mathbb{E}_g\left[\frac{\text{Day-Trade Volume}_{\text{pre}}}{\text{Portfolio Size}_{\text{pre}}}\right] \times \mathbb{E}_g[\Delta \text{Tax}]}_{\text{Mechanical Tax Cut Benefit}}$$



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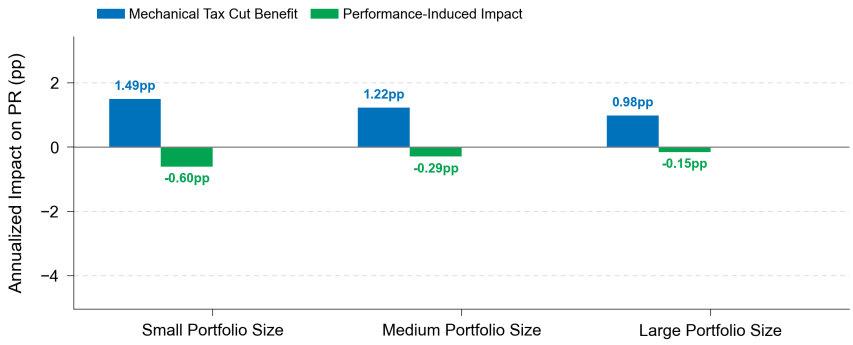

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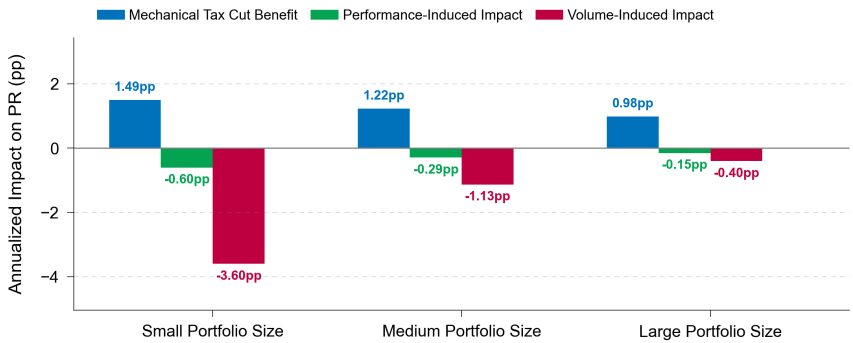

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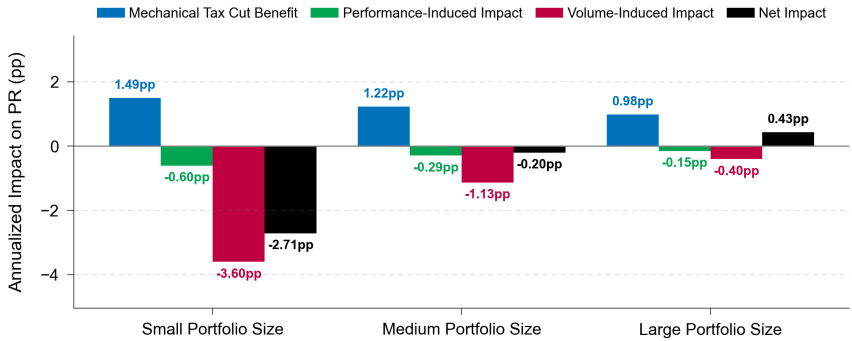

- Distributional effect: small investors lose, large investors benefit Aggregate
- Average $\Delta PR = -0.8\%$ p.a. $\rightarrow$ less sophisticated investors increase trading excessively Wealth table Performance of other

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Market-Level Impacts

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- Yet, the net market impact of this increase is **debated** in the literature:
  - Destabilizing force (e.g. acting on incorrect beliefs) → increases volatility

    Stiglitz (1989); Summers and Summers (1989); Black (1986); Shleifer and Summers (1990); De Long et al. (1990a, 1990b); Campbell, Grossman, and Wang (1993); Campbell and Kyle (1993)
  - Liquidity provision (e.g. buy low and sell high) → decreases volatility

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    Ross (1989); Schwert and Seguin (1993); Heaton and Lo (1995); Song and Zhang (2005)
- Our setting: only transaction costs for day trading change
  → Identify **which channel** dominates when costs fall

Empirical Strategy for Identifying Market Impacts

- In Taiwan, a subset of stocks is **ineligible** for day trading $\rightarrow$ unaffected by tax reform

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  - Treatment group: common stocks eligible for day trading as of April 2017 ($\sim$1,300 stocks)
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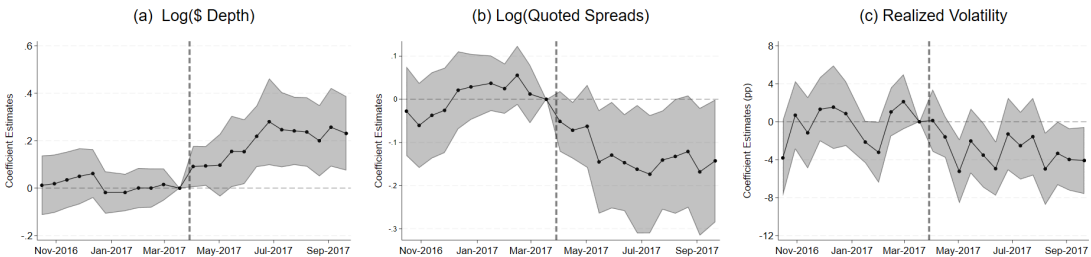
- Eligibility is not affected by tax reform. Stocks are ineligible if:
  - They are depositary receipts of foreign firms
  - Or excluded by exchanges based on listing tenure, market value and financial status
- **Match pre-period means** of outcome variables with entropy balancing
  - Liquidity: order book depth, quoted spreads
  - Volatility: standard deviation of 10-minute price changes

Sum. stats Balance Test

Market Quality Changes

- **Liquidity** ↑: deeper order books (+14%), narrower spreads (-13%)
- **Volatility** ↓ by 2.6 p.p. (10% of mean)



- Suggests **liquidity-providing effect** of noise traders dominates their destabilizing effect
- Day traders in aggregate exhibit contrarian behavior ⇒ consistent with liquidity provision Contrarian

Raw plots DiD estimates Market structure Average trade Model

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⇒ Highlights a **trade-off** for policies affecting retail trading costs, or retail speculation in general

Bloomberg

Day-Trading Restraints to Be Loosened Under Proposed Rule Change

By Jayna Rohslau and Katherine Doherty

July 21, 2025 at 10:50 AM CDT

Appendix

Day Trading and Retail Investors

	Korea	Finland	Brazil	US (Nasdaq)	Taiwan
Period	1999–2000	1995–2002	2012–2018	1999	1995-2017
Day trading (% of retail volume)	43%	64%	50%	–	22%
Day trading (% of market)	30%	4%	7%	15%	17%

Source: Lee et al. (2007); Chung et al. (2009); Linnainmaa (2005a,b); Chague et al. (2025a,b); Birru et al. (2021); Senate Report 106-364 (2000); Barber et al. (2009, 2014, 2019).

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Changes in Day Trade Realization Rate

$$\text{Realization Rate on Days with Day Trades}_{i,t} = \frac{\#\ \text{Day Trades}_{i,t}}{\#\ \text{Open Trades on Days with Day Trades}_{i,t}}$$

	Realization Rate (pp)
	(1)
Post	1.50***
	(0.14)
Constant	76.77***
	(0.07)
Observations	404,704
Adj. R^2	0.36
Investor FE	✓
Cluster	Investor

Back

DiD Estimator

$$
\begin{aligned}
\text{ATT} &= \mathbb{E}[\text{Volume}^{Day}_{post}(1) - \text{Volume}^{Day}_{post}(0) \mid D = 1] \\
&= \underbrace{\mathbb{E}[\text{Volume}^{Day}_{post}(1) - \text{Volume}^{Day}_{pre}(0) \mid D = 1]}_{\text{Change w/ Tax Reform (Observed)}} - \underbrace{\mathbb{E}[\text{Volume}^{Day}_{post}(0) - \text{Volume}^{Day}_{pre}(0) \mid D = 1]}_{\text{Change w/o Tax Reform (Unobserved)}}
\end{aligned}
$$

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- To measure **what would have happened**, typically, we assume:

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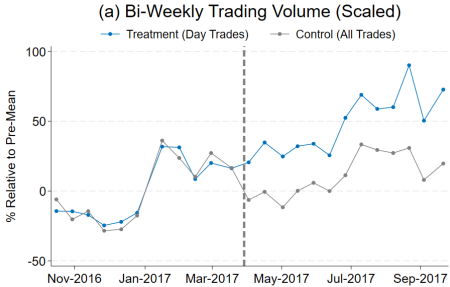
- But, technically fine:

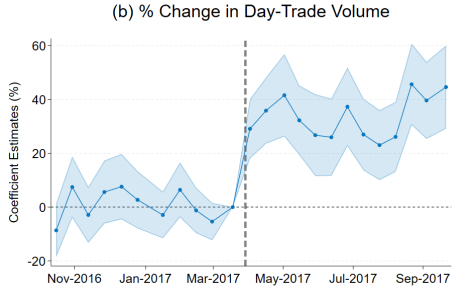
$$\mathbb{E}[\text{Volume}^{Day}_{post}(0) - \text{Volume}^{Day}_{pre}(0) \mid D = 1] = \mathbb{E}[\underbrace{\text{Volume}^{Total}_{post}(0) - \text{Volume}^{Total}_{pre}(0)}_{\text{Different Outcome}} \mid D = 0]$$

PT assumption

$$\underbrace{\frac{\mathbb{E}[\text{Volume}^{Day}_{i,\ post}(0) \mid D_i = 1]}{\mathbb{E}[\text{Volume}^{Day}_{i,\ pre}(0) \mid D_i = 1]}}_{\%\Delta \text{ Day-Trade Volume by Treatment}}$$

$$\underbrace{\frac{\mathbb{E}[\text{Volume}^{Total}_{i,\ post}(0) \mid D_i = 0]}{\mathbb{E}[\text{Volume}^{Total}_{i,\ pre}(0) \mid D_i = 0]}}_{\%\Delta \text{ Total Volume by Control}}$$





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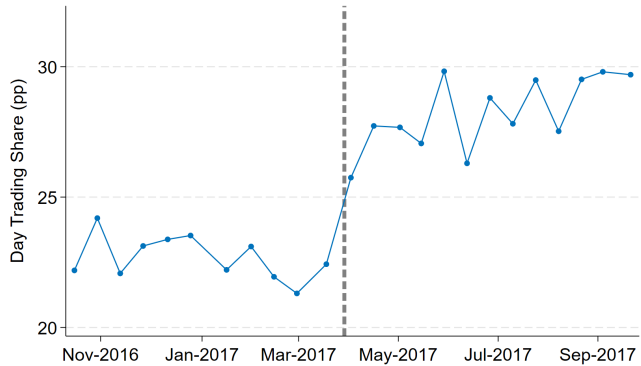
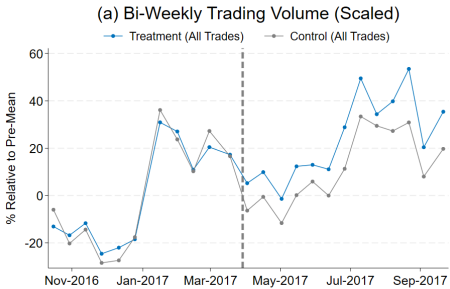
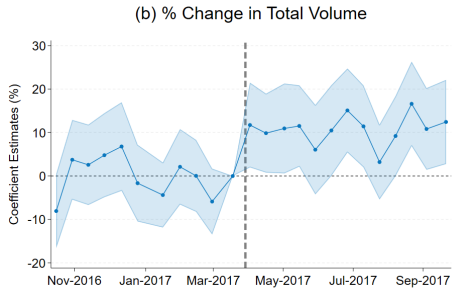


- This rules out shocks differentially affecting day trading other than the tax reform

PT assumption

$$\underbrace{\frac{\mathbb{E}[\text{Volume}_{i,\,post}^{Day}(0) \mid D_i = 1]}{\mathbb{E}[\text{Volume}_{i,\,pre}^{Day}(0) \mid D_i = 1]}}_{\%\Delta \text{ Day-Trade Volume by Treatment}} \overset{\text{(Fixed Ratio)}}{=} \frac{\mathbb{E}[\text{Volume}_{i,\,post}^{Total}(0) \mid D_i = 1]}{\mathbb{E}[\text{Volume}_{i,\,pre}^{Total}(0) \mid D_i = 1]} \overset{\text{(Parallel Trend)}}{=} \underbrace{\frac{\mathbb{E}[\text{Volume}_{i,\,post}^{Total}(0) \mid D_i = 0]}{\mathbb{E}[\text{Volume}_{i,\,pre}^{Total}(0) \mid D_i = 0]}}_{\%\Delta \text{ Total Volume by Control}}$$





- This assumes total volume of treatment and control grows proportionally

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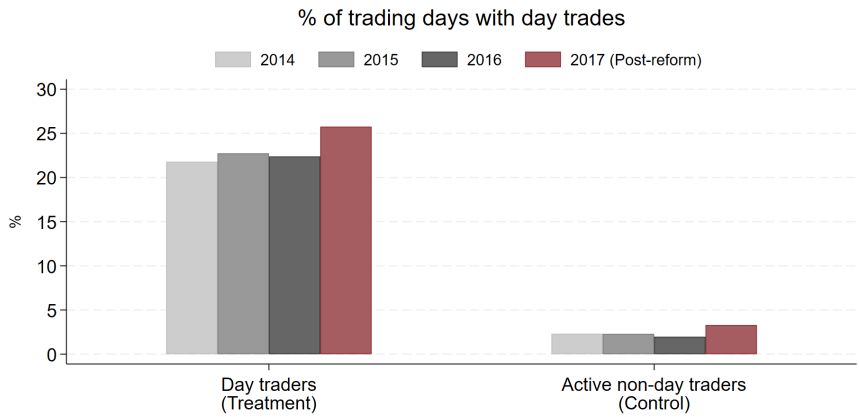
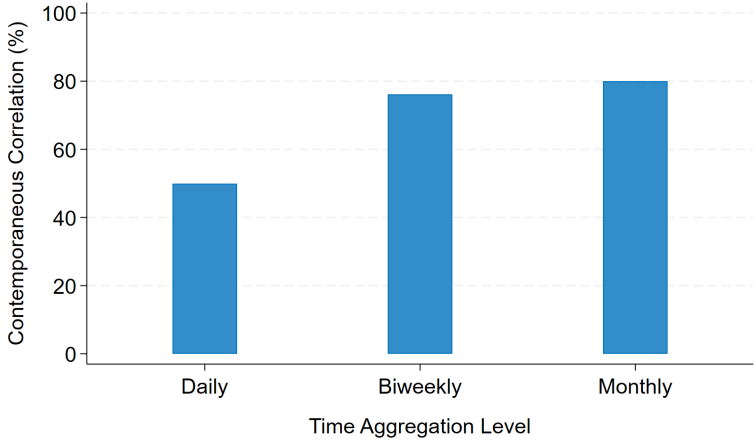
Probability of Day Trading in Reform Year



Back

Contemporaneous Correlation

Contemporaneous correlation of day trades for treatment & all trades for control:



Compare Frequency with US

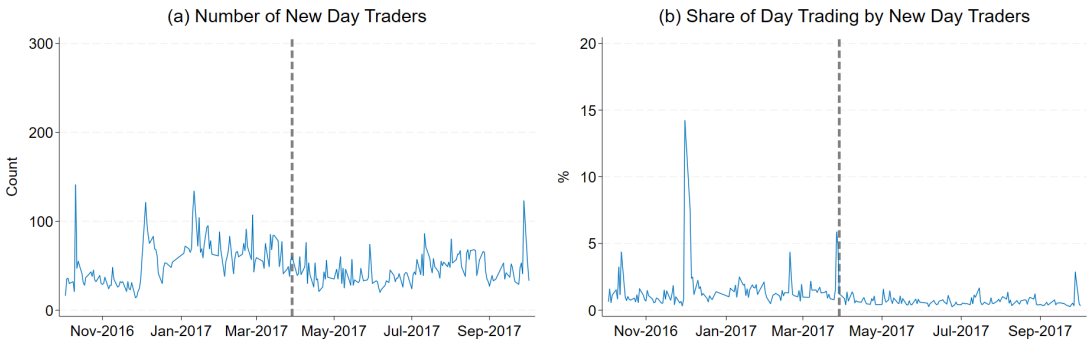
Table: Number of day trades per investor-month

Market	**p10**	**p25**	**p50**	**p75**	**p90**	**Mean**
Taiwan (Our treatment group)	0	0	1	3	9	4
US (5,000 traders)*	0	0	4	22	65	23

*Bogousslavsky & Muravyev (2025)

Back

Effect of Tax Cut on Extensive Margin



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Comparison with Barber et al (2009, 2019)

- Barber et al (2009, 2019) study Taiwanese retail investors using account-level data for the universe of trades on TSE
- Their data range from 1995 to 2006

	BLLO's sample (1995-2006)	Our sample (2015-2017)
Average investor:		
Trade size (NTD)	190,656	228,102
Average day trader:		
# Trading day	42.9	70.2
# Day trading day	12.9	15.1

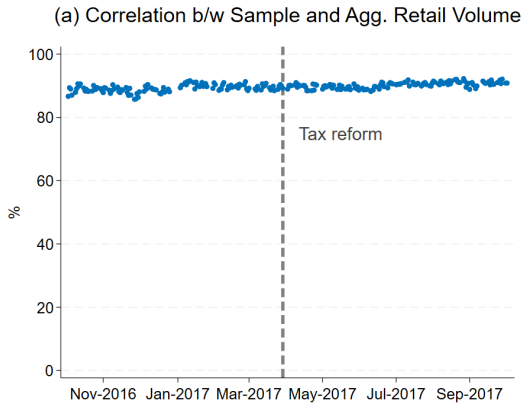
– BLLO define day traders as investors with at least one day trade in a year

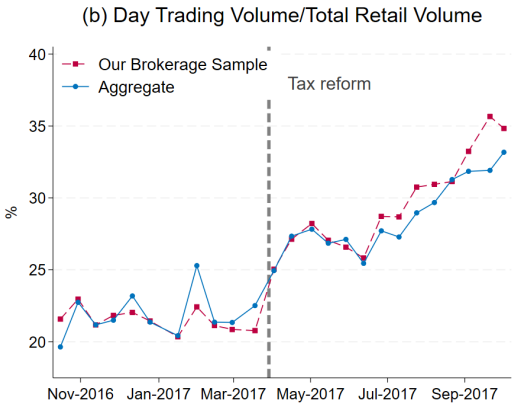
Back

Comparison of Brokerage Samples Across Studies

	Our Study	**Barber & Odean (2000, 2001)**	**Dorn et al. (2005)**
Data Source	Taiwan Broker	US Discount Broker	German Broker
Period	2012–2017	1991–1996	1995–2000
Sample Size	120,257 traders	66,465 households	21,528 traders
Demographics			
Age (years)	48.4	50.6	39.7
Male (%)	50.2	79.2	83.0
Account Tenure (years)	11.2	—	3.2
Account Characteristics			
Trade Size (USD)	7,160	12,350	—
Monthly Volume (USD)	30,128	—	—
Monthly Turnover (%)	12.3	12.7	16.1
Portfolio Value (USD)	68,495	47,334	68,360

Coverage of brokerage data





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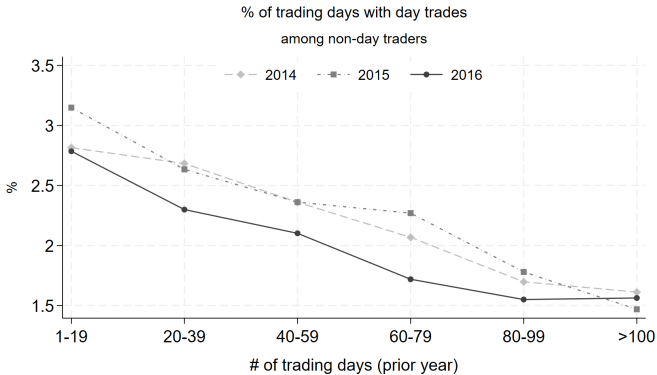
More active non-day traders have lower day trade probability

- Being a active non-day trader this year $\Rightarrow$ lower future day trading probability



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DiD in average day trading volume

Different definition of control group

	Volume			
	(1) Control $>$ 10 days	(2) Control $>$ 20 days	(3) Control $>$ 30 days	(4) Control $>$ 40 days
Treat $\times$ Post	0.25***	0.26***	0.26***	0.29***
	(0.02)	(0.02)	(0.03)	(0.04)
Observation	791,376	518,688	425,064	381,720
Pseudo R^2	0.76	0.79	0.80	0.81
Investor FE	✓	✓	✓	✓
Day FE	✓	✓	✓	✓
Cluster	Investor	Investor	Investor	Investor

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Trader characteristics

Treatment and Control

	Treatment						Control					
	N(investor)	Mean	SD	p25	p50	p75	N(investor)	Mean	SD	p25	p50	p75
Account Tenure (Years)	14,049	11.43	6.48	6.00	11.00	17.00	3,652	12.48	6.51	7.00	13.00	17.00
Age (Years)	14,049	51.03	12.41	42.00	51.00	60.00	3,652	51.46	12.41	42.00	51.00	60.00
Is male (%)	14,049	57.14	49.49	0.00	100.00	100.00	3,652	58.08	49.35	0.00	100.00	100.00
Portfolio Size (USD)	14,049	134,343.23	290,180.77	13,454.56	41,438.75	118,734.80	3,652	147,637.00	249,960.09	25,649.91	65,301.43	152,104.23
Monthly volume (USD)	14,049	134,900.28	267,638.26	16,972.44	46,060.22	126,665.28	3,652	45,472.03	75,256.00	8,252.31	19,838.22	48,131.50
Monthly # any trades	14,049	18.51	21.97	5.17	11.17	22.67	3,652	8.00	6.75	3.33	6.17	10.50
Trade size (USD)	14,049	8,393.64	13,667.13	2,007.48	3,819.35	8,264.66	3,652	6,126.78	8,604.83	1,704.48	3,148.29	6,505.65
Monthly turnover (%)	14,049	83.34	126.12	15.62	38.61	93.54	3,652	28.09	36.92	6.53	14.81	33.76
Monthly day-trade volume (USD)	14,049	25,844.99	74,472.74	841.39	3,221.22	13,839.89	3,652	417.10	1,471.78	0.00	0.00	0.00
Monthly # day trades	14,049	3.45	7.39	0.33	0.83	2.67	3,652	0.08	0.20	0.00	0.00	0.00
Day-trade size (USD)	14,049	7,421.53	11,952.47	1,724.26	3,413.61	7,541.19	841	5,839.70	9,310.03	1,445.58	2,820.00	6,146.67
Day-trade return (bps)	14,049	32.40	130.40	-30.40	19.93	91.34	841	60.79	190.75	-22.95	32.89	140.43

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DiD estimates for trading response

	Volume		
	(1) All vs. All Trades	(2) Day vs. All Trades	(3) Non-day vs. All Trades
Treat × Post	0.05**	0.26***	-0.02
	(0.02)	(0.03)	(0.02)
Observation	425,256	425,064	422,352
Pseudo R^2	0.82	0.80	0.79
Investor FE	✓	✓	✓
Day FE	✓	✓	✓
Cluster	Investor	Investor	Investor

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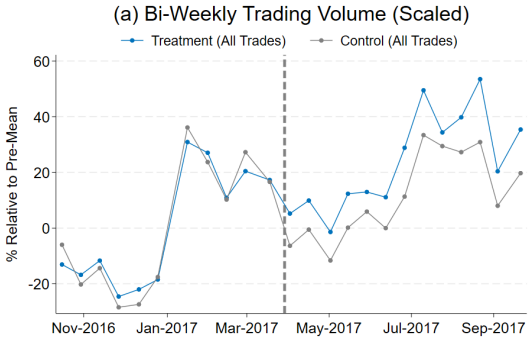
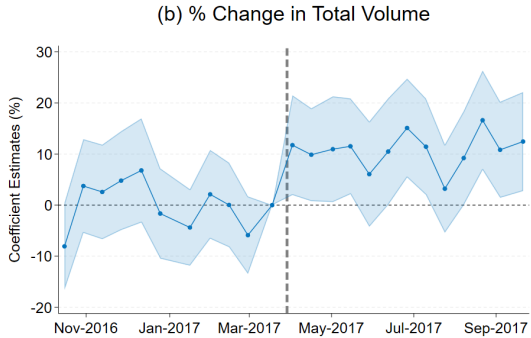
Dynamic DiD on Volume

All vs All





Back (Day vs All)

Using market return as benchmark

$$\text{Excess returns}_t = \alpha + \gamma\ \text{Post}_t + \beta_1\ \text{Market Ex.Returns} + \beta_2\ \text{Market Ex.Returns} \times \text{Post} + \varepsilon_t$$

	Excess Returns	
	(1) Day Trades	(2) All Trades
Alpha	6.11***	-20.56***
	(0.95)	(1.88)
Post	-4.75**	-1.56
	(1.94)	(2.06)
Market Ex. Returns	0.16***	0.03
	(0.02)	(0.03)
Market Ex. Returns × Post	-0.00	-0.07
	(0.04)	(0.04)
Observation	247	247
Adj. R^2	0.27	0.00
Cluster	Month	Month

DiD estimate on gross return

	Gross Returns per $ Traded (bps)		
	(1) All vs. All Trades	(2) Day vs. All Trades	(3) Non-day vs. All Trades
Treat × Post	-2.47*	-5.32**	0.33
	(1.39)	(2.21)	(0.78)
Observation	1,642,414	633,955	1,513,473
Adj. R^2	0.04	0.18	0.02
Investor FE	✓	✓	✓
Day FE	✓	✓	✓
Cluster	Investor, Day	Investor, Day	Investor, Day

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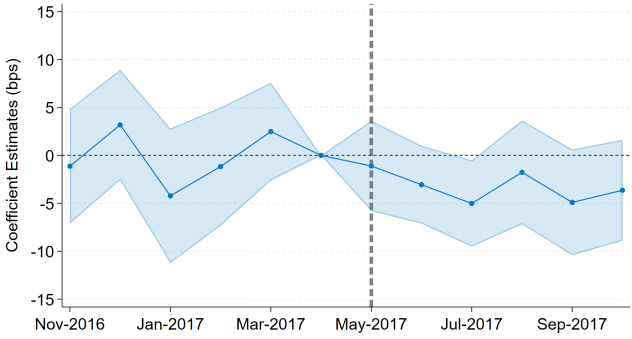
Dynamic did on returns

All vs All trades



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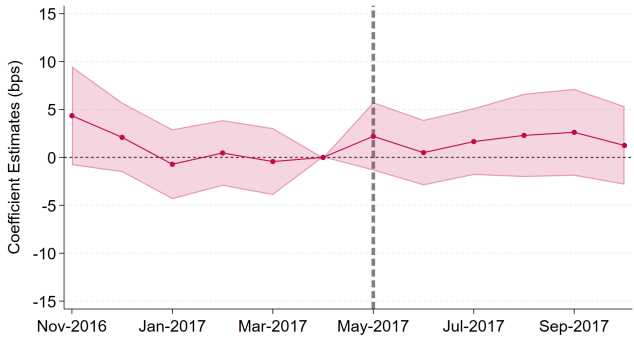
Dynamic did on returns

Non-day vs All trades



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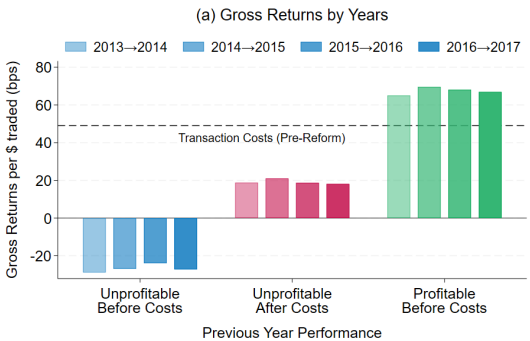
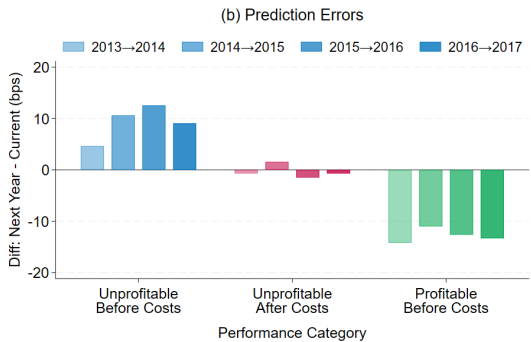
Predictive Power of Past Performance





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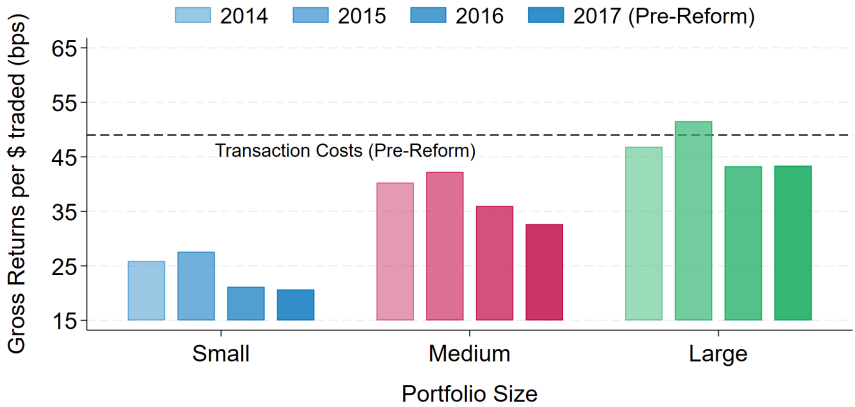
Gross Return and Portfolio Size



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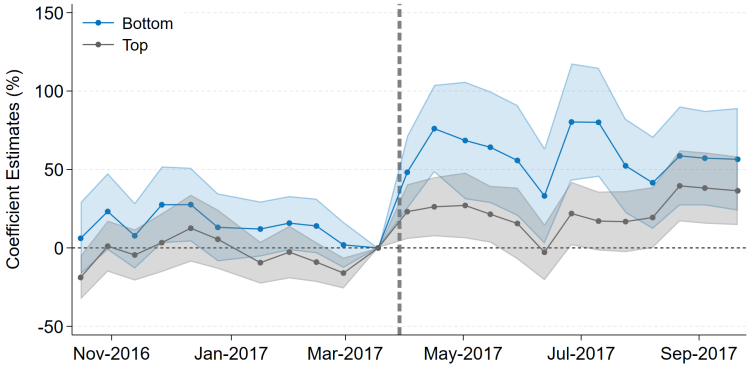
Parallel trend by wealth



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DiD estimates for trading responses by wealth

	$ Volume		
	(1) Small Portfolio Size	(2) Medium Portfolio Size	(3) Large Portfolio Size
Treat × Post	0.35***	0.26***	0.21***
	(0.04)	(0.03)	(0.05)
Observation	141,720	141,648	141,696
Pseudo R^2	0.79	0.81	0.80
Investor FE	✓	✓	✓
Day FE	✓	✓	✓
Cluster	Investor	Investor	Investor

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DiD estimates for trading responses by skill

	$ Volume		
	(1) Unprofitable before costs	(2) Unprofitable after costs	(3) Profitable after costs
Treat × Post	0.20***	0.26***	0.06
	(0.03)	(0.03)	(0.06)
Observation	116,640	133,680	95,736
Pseudo R^2	0.74	0.80	0.67
Investor FE	✓	✓	✓
Day FE	✓	✓	✓
Cluster	Investor	Investor	Investor

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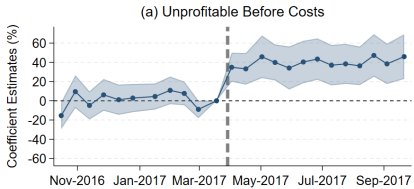
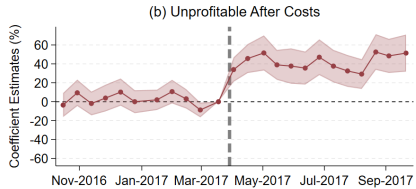
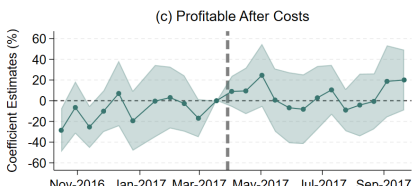
Parallel trend by skill







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Holding Period Returns as Counterfactual

Treatmeat: day-trade returns, Control: X-day holding period returns (normalized to daily)

	Gross Returns per $ Traded (bps)	
	(1)	(2)
	10-Day Holding Period Returns	30-Day Holding Period Returns
Treat × Post	-3.80**	-3.71**
	(1.73)	(1.70)
Observation	633,955	633,955
Adj. R^2	0.20	0.21
Investor FE	✓	✓
Day FE	✓	✓
Cluster	Investor, Day	Investor, Day

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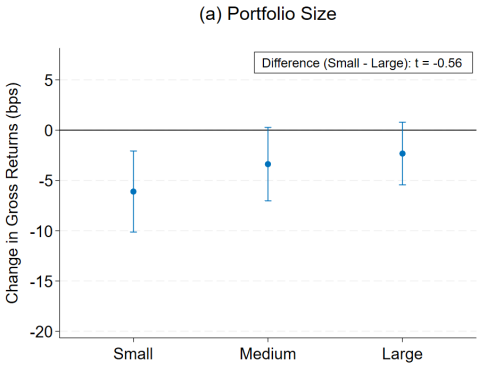
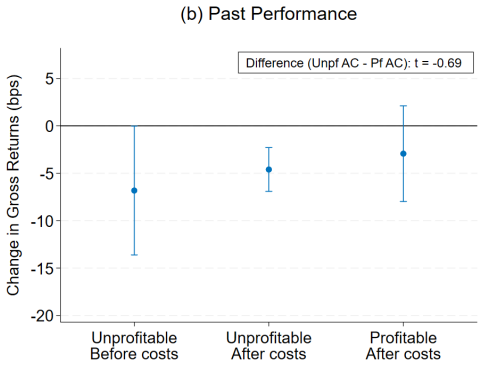
Heterogeneity in performance responses





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Financial Impact by Portfolio Value

Portfolio Size	(1) Day-trade Volume (pre) ($)	(2) Net Return (post) (bps)	(3) $\frac{\text{Day-Trade Volume}_{pre}}{\text{Portfolio Size}_{pre}}$	(4) $\frac{\text{Net return}_{post}}{\text{Portfolio Size}_{pre}}$ (bps/$)	(5) Population Share (%)	(6) Volume Response (%)	(7) Performance Response (bps)	(8) Mechanical Tax Cut Benefit (% p.a.)	(9) Net Impact (% p.a.)	(10) Avg. Mechanical Benefit (% p.a.)	(11) Avg. Net Impact (% p.a.)	(12) PR_{pre} (% p.a.)
Small	24,694	-21.68	0.83	-0.0029	33.4	41.9	-6.04	1.49	-2.71	1.23	-0.83	-6.34
Medium	28,813	-7.02	0.68	-0.0011	33.3	29.7	-3.56	1.22	-0.20			-4.74
Large	31,750	-1.22	0.55	-0.0005	33.3	23.4	-2.33	0.98	0.43			-3.26

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DiD estimate for use of cognitive shortcuts

	Share of Round-Number Orders (pp)
	(1)
Treat × Post	2.07***
	(0.33)
Observation	620,836
Adj. R^2	0.33
Investor FE	✓
Day FE	✓
Cluster	Investor

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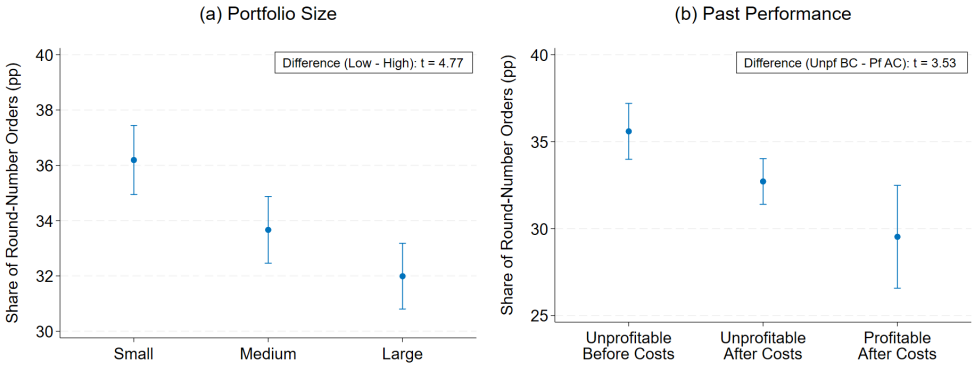
Use of cognitive shortcuts leads to worse performance

$$\text{Day-trade gross returns}_{i,s,t} = \beta\ \text{Cognitive shortcuts}_{i,s,t} + \text{FEs} + \varepsilon_{i,s,t}$$

	Gross Returns (bps) (Day Trades)
	(1)
Cognitive shortcuts	-6.50***
	(1.14)
Observation	702,733
Adj. R^2	0.16
Investor FE	✓
Stock FE	✓
Day FE	✓
Cluster	Investor, Day

- Cognitive shortcuts: equals 1 when share of round-number orders $> 50\%$
- Round-number orders $\rightarrow$ more adverse selection risk, incur larger bid-ask spreads

Use of cognitive shortcuts correlates with ability



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Summary stats of treated and control stocks

Panel A. Before Matching

	Treatment stocks			Control stocks		
	N(Stocks)	Mean	SD	N(Stocks)	Mean	SD
Market Cap. (bn USD)	1330	0.74	5.05	189	0.06	0.11
Volume (mn USD)	1330	2.21	7.25	189	0.18	0.42
Price (USD)	1330	1.62	4.33	189	0.93	1.24
Market Beta	1330	0.87	0.26	189	0.75	0.31
Depth (USD)	1330	64.23	159.88	189	9.63	13.48
Quoted Spread (bps)	1330	62.26	55.90	189	194.71	139.76
Realized Volatility (%)	1330	26.37	9.61	189	37.90	11.02
Institutional Ownership (%)	1330	11.91	14.92	189	5.94	11.06
Day Trading Share (%)	1330	7.44	5.79	0	.	.
Total Asset (bn USD)	1330	2.07	12.99	189	0.15	0.72
Net Income (mn USD)	1330	59.97	422.90	189	0.72	33.50
ROA (%)	1330	9.40	7.37	189	2.16	9.93

Panel B. After Matching

	Treatment stocks			Control stocks		
	N(Stocks)	Mean	SD	N(Stocks)	Mean	SD
Market Cap. (bn USD)	1330	0.09	0.59	189	0.06	0.11
Volume (mn USD)	1330	0.37	1.59	189	0.18	0.42
Price (USD)	1330	0.89	1.25	189	0.93	1.24
Market Beta	1330	0.71	0.27	189	0.75	0.31
Depth (USD)	1330	11.55	32.36	189	9.63	13.48
Quoted Spread (bps)	1330	204.54	153.33	189	194.71	139.76
Realized Volatility (%)	1330	37.90	10.20	189	37.90	11.02
Institutional Ownership (%)	1330	5.88	11.00	189	5.94	11.06
Day Trading Share (%)	1330	7.32	4.83	0	.	.
Total Asset (bn USD)	1330	0.14	1.43	189	0.15	0.72
Net Income (mn USD)	1330	3.88	47.87	189	0.72	33.50
ROA (%)	1330	5.45	6.56	189	2.16	9.93

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DiD Estimates on market quality

	Log($ Depth)		Log(Quoted Spreads)		Realized Volatility (pp)	
	(1) Matched Entropy	(2) Matched PSM	(3) Matched Entropy	(4) Matched PSM	(5) Matched Entropy	(6) Matched PSM
Treat × Post	0.14**	0.15**	-0.13**	-0.12**	-2.67**	-2.72**
	(0.06)	(0.06)	(0.06)	(0.05)	(1.29)	(1.29)
Observation	364,703	128,037	363,911	127,625	364,703	128,037
Adj. R^2	0.70	0.67	0.75	0.75	0.13	0.13
Stock FE	✓	✓	✓	✓	✓	✓
Day FE	✓	✓	✓	✓	✓	✓
Cluster	Stock	Stock	Stock	Stock	Stock	Stock

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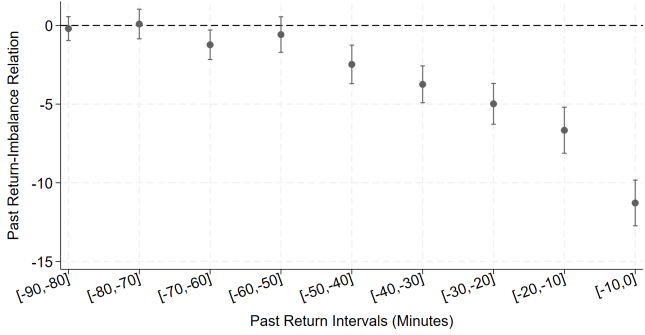
Contrarian Trading

Divide a trading day t into 10-minute intervals τ. Compute order imbalance for each stock s as

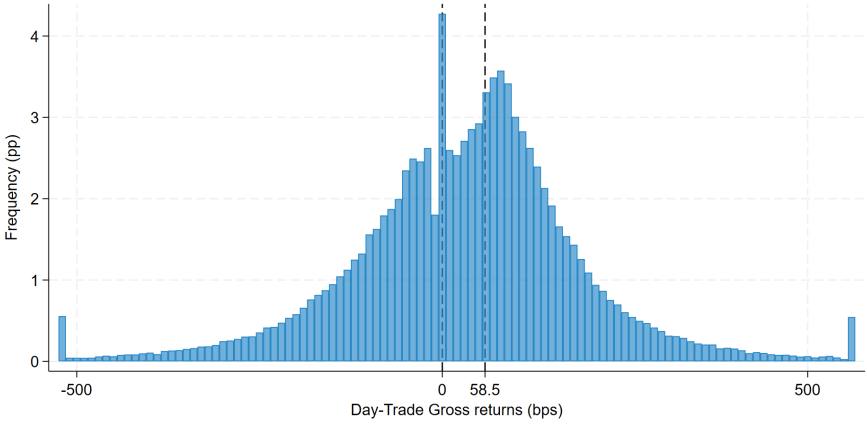
$$\text{Order Imbalance}_{s,t,\tau} = \frac{\text{Shares Bought}_{s,t,\tau} - \text{Shares Sold}_{s,t,\tau}}{\text{Shares Bought}_{s,t,\tau} + \text{Shares Sold}_{s,t,\tau}}$$

$$\text{Order Imbalance}_{s,t,\tau} = \sum_k \beta_k \text{ Past 10-minute Returns}_{s,t,\tau} + \text{FEs} + \varepsilon_{s,t,\tau}$$

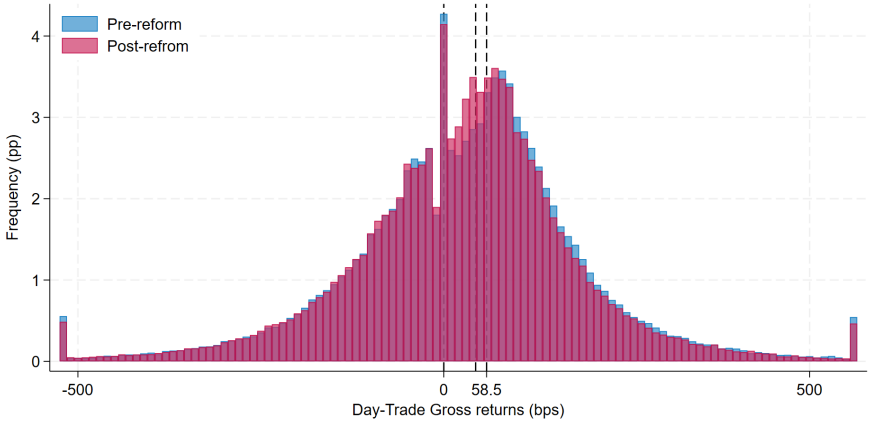


- 1 pp ↑ in prices over past 10 minutes ⇒ 10 pp ↓ in day traders' order imbalance. Back

Disposition Effect of Day Traders



Disposition Effect of Day Traders



- Returns lowered more than the new cost-threshold

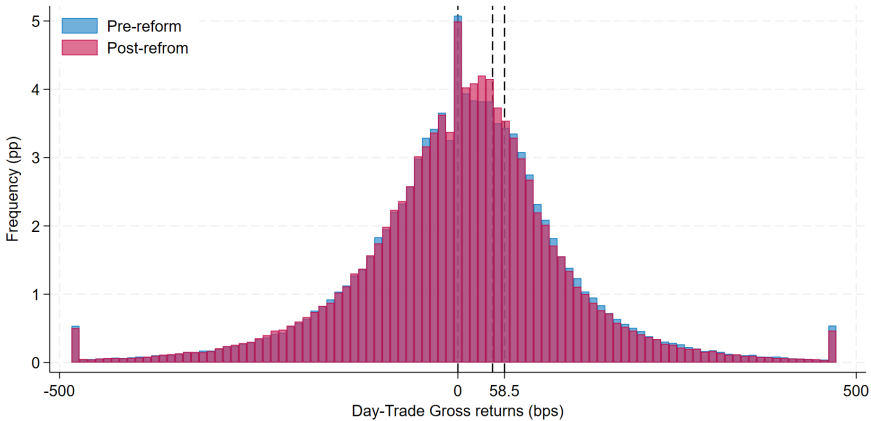
Changes in Day Trade Realization Rate

$$\text{Realization Rate on Days with Day Trades}_{i,t} = \frac{\#\ \text{Day Trades}_{i,t}}{\#\ \text{Open Trades on Days with Day Trades}_{i,t}}$$

	Realization Rate (pp)
	(1)
Post	1.50***
	(0.14)
Constant	76.77***
	(0.07)
Observations	404,704
Adj. R^2	0.36
Investor FE	✓
Cluster	Investor

Using All Open Trades on Days with Day Trades

Expand definition: (1) Realized day trades + (2) All other open trades on the same day



Results Robust to Using All Open Trades

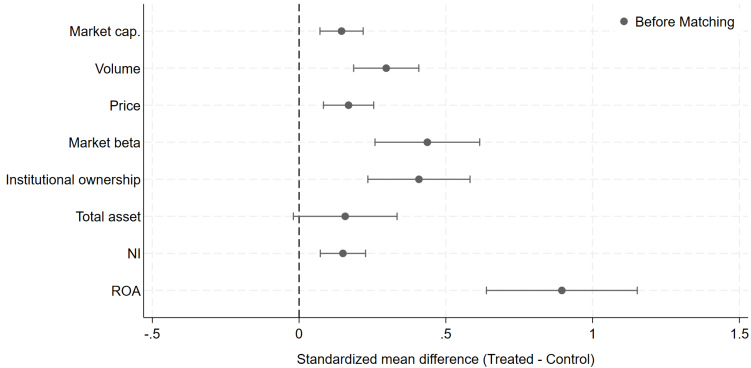
New trades definition: (1) Realized day trades + (2) All other open trades on the same day

	Intended Day vs All Trades	
	(1) Volume	(2) Gross Returns (bps)
Treat × Post	0.25***	-4.94**
	(0.02)	(2.45)
Observations	425,064	633,955
Pseudo R^2	0.78	
Adj. R^2		0.14
Investor FE	✓	✓
Day FE	✓	✓
Cluster	Investor	Investor, Day

Back to Volume Back to Performance

Characteristics After Balancing

- Treated and control stocks quite different before matching



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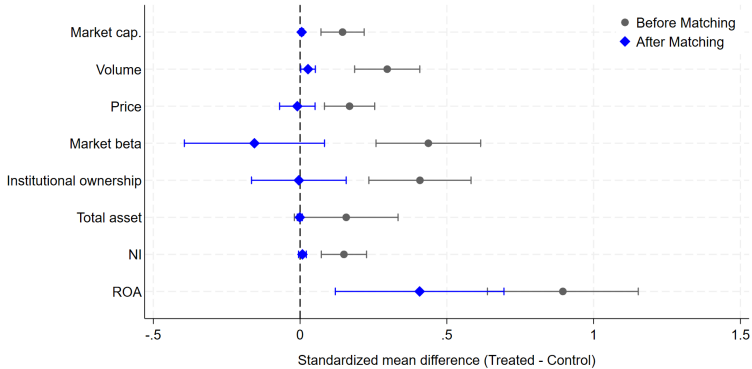
Characteristics After Balancing

- Treated and control stocks become similar even in characteristics not directly matched



- Also employed propensity score matching to ensure results are robust to matching methods
- Effect not driven by ROA based on a placebo test splitting treated stocks into high vs low ROA

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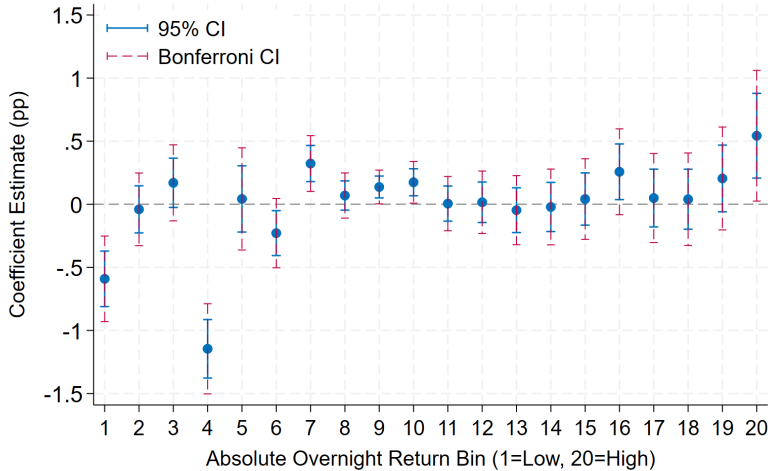
Changes in Share of Trading Volume by Retrun Bins



Limit Order Monitoring

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  - Retail investors often fail to do so leading to poor returns (Linnainmaa, 2010)

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$$\text{Order idle time}_{i,o,t} = \begin{cases} \text{Execution time}_{i,o,t} - \text{Submission time}_{i,o,t}, & \text{if executed} \\ \text{Cancellation time}_{i,o,t} - \text{Submission time}_{i,o,t}, & \text{if canceled} \\ \text{Market close (1:30 pm)} - \text{Submission time}_{i,o,t}, & \text{otherwise} \end{cases}$$

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  2. Lower **probability of modification** or **cancelation**

Limit Order Monitoring

$$\text{Outcome}_{i,t} = \beta\ \text{Treat}_i \times \text{Post}_t + \text{FEs} + \varepsilon_{i,t}$$

	Log(Order Idle Time)	Prob. of Modification (pp)
	(1)	(2)
Treat × Post	0.04***	-0.77***
	(0.01)	(0.24)
Observation	620,836	620,836
Adj. R^2	0.41	0.60
Investor FE	✓	✓
Day FE	✓	✓
Cluster	Investor	Investor

- **Order idle time ↑ by 4%** and **probability of modification ↓ by 0.7 pp** (4% of mean)
- Consistent with monitoring efforts ↓ and neglect ↑

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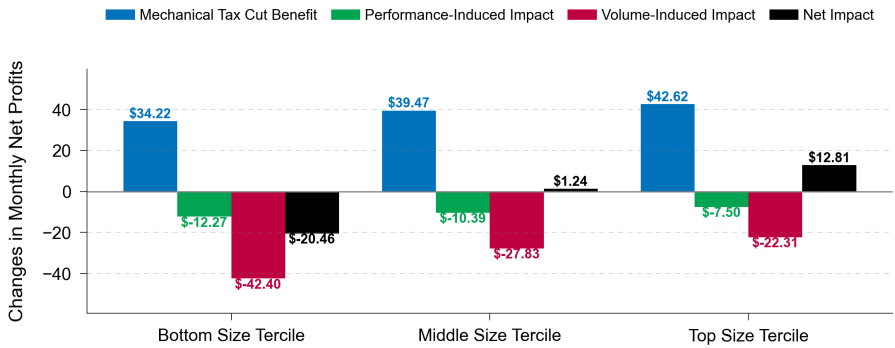
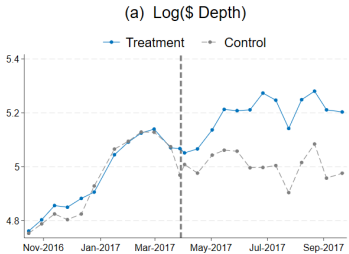
Aggregate Financial Impact

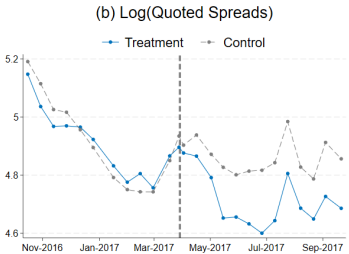
Per person per month:

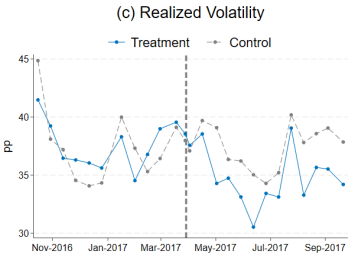


- In aggregate, the reform result in a total day trader losses of \$0.2 million/month, and loss of \$2.5 million/month in tax revenue
- The tax revenue from day trading in the pre-period is \$22 million/month.

Market Quality Changes—Matched Raw Data







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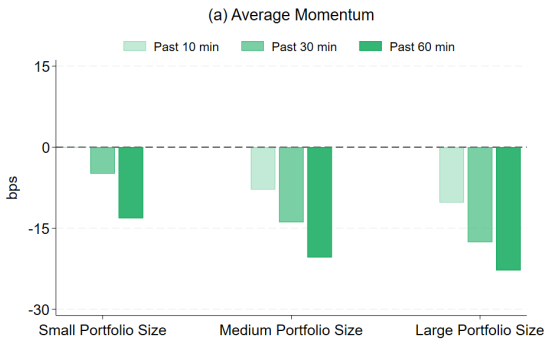
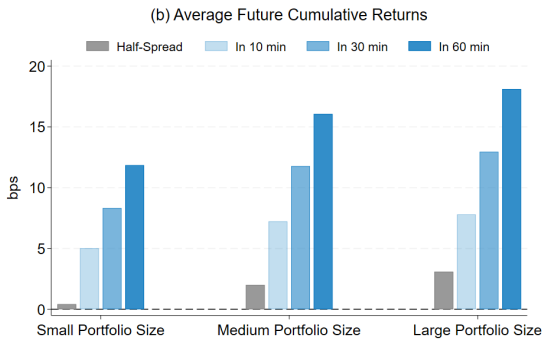
Behavior of the Average Day Trade

Compute past returns and future returns associated with the average trade (buy + sell orders):





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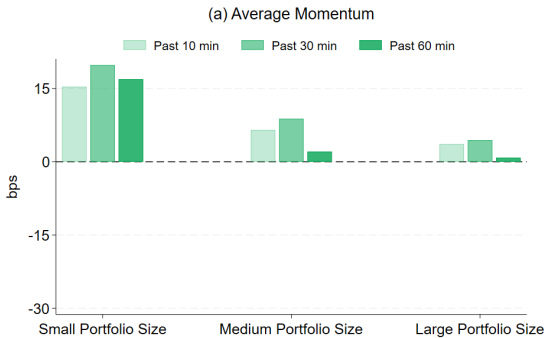
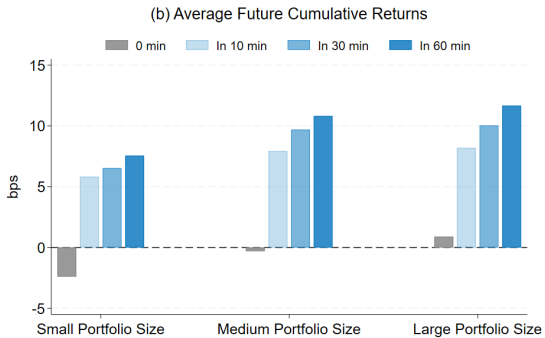
Behavior of the Average Day Trade—Buy Orders

Compute past returns and future returns associated buy orders among day trade





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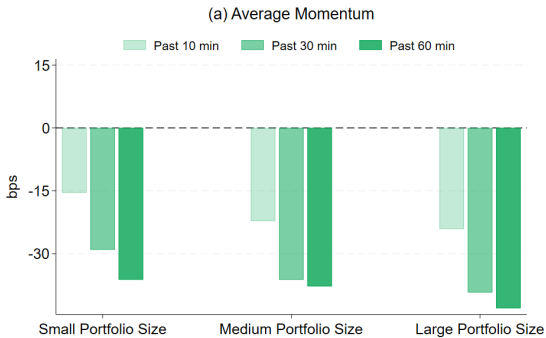
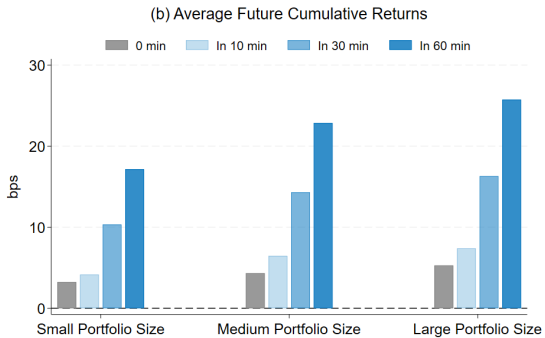
Behavior of the Average Day Trade—Sell Orders

Compute past returns and future returns associated sell orders among day trade





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Model

Model **objective**: illustrate the competing forces when transaction costs for noise traders fall

Key ingredients: noise traders optimize with incorrect belief and **exogenous supply shocks**

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Setup: one-period, a risky asset realizing v in period two. $v \sim N(v_0, \sigma_v^2)$

- Informed traders (I) with measure $1 - \phi$.
  - Belief: $\mathbb{E}_I[v] = v_0$
- Noise traders (N) with measure ϕ.
  - Incorrect belief with random sentiment ρ: $\mathbb{E}_N[v] = v_0 + \rho, \quad \rho \sim N(\rho_0, \sigma_\rho^2)$
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Intuition for competing forces:

- **Without** noise traders: price volatility determined by exogenous shocks
- **With** noise traders: price impact of shocks **attenuated** but **new source** of volatility, ρ

Market quality

- Price impact is the price change when demand exogenously increases: $P^*(z-1) - P^*(z)$
  - Always decreases with c_N: $c_N \downarrow \Rightarrow$ noise trader participation $\uparrow \Rightarrow$ attenuate supply shocks
- Standard deviation of P^*: $Sd(P^*)$
  - Effect of $c_N \downarrow$ depends on relative size of sentiment (σ_ρ^2) and supply shocks (σ_z^2)

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2. When $\sigma_\rho^2 \ll \sigma_z^2$: both informed and noise traders trade against supply shocks,
   - $c_N \downarrow \Rightarrow$ more noise traders help absorb shocks $\Rightarrow Sd(P^*) \downarrow$

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Comparison with Wu and Wang (2020)

- Wu and Wang (2020) studies the market impact of the same STT reform on day trading in Taiwan
- Summary of the main difference

	Wu and Wang (2020)	**This paper**
Sample	30 most active stocks vs. 30 most active ETFs	$\sim$1300 day-tradable stocks vs. $\sim$190 non-day-tradable stocks
Measure	Liquidity: Amihud illiquidity Volatility: Daily price range	Liquidity: Order book depth, quoted spread Volatility: 10-minute return volatility
Findings	Liquidity $\uparrow$ Volatility $\uparrow$ (PSM), null (DiD)	Liquidity $\uparrow$ Volatility $\downarrow$ (Matched DiD)

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Comparison with Even-Tov et al (2022)

- Even-Tov et al (2022) studies effects of fee reductions for non-leveraged equity trades on an online brokerage platform using a cross-country triple-difference research design

	This paper	**Even-Tov et al. (2022)**
Focus	Day trades	Non-leveraged equity trades
Findings	Trading volume ↑ Performance ↓ Financial Impact Market-level effects	Trading volume ↑ Performance: null effect — —
Trading performance metric	Return per dollar traded	Equal-weighted, transaction-based portfolio approach Portfolio-level return analysis

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Market-level External Validity

Key Market Structure Differences

- Lack of HFTs or incentives for MM
  - Day traders become informal MM $\Rightarrow$ liquidity provision channel $\uparrow$
- Retail investors account for 70% of total trading volume
  - Retail increases volatility (Foucault et al. 2011) $\Rightarrow$ liquidity provision channel $\uparrow$
  - Retail provides liquidity (Barrot et al. 2016) $\Rightarrow$ liquidity provision channel $\downarrow$
- Call auction order matching
  - Limits ability to update quotes in real time $\Rightarrow$ liquidity provision channel $\downarrow$

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Comparison of Brokerage Samples across Studies

	Our Study	**Barber & Odean (2000, 2001)**	**Dorn et al. (2005)**
Data Source	Taiwan Broker	US Discount Broker	German Broker
Period	2012–2017	1991–1996	1995–2000
Sample Size	120,257 traders	66,465 households	21,528 traders
Demographics			
Age (years)	48.4	50.6	39.7
Male (%)	50.2	79.2	83.0
Account Characteristics			
Account Tenure (years)	11.2	—	3.2
Trade Size (USD)	7,160	12,350	—
Monthly Volume (USD)	30,128	—	—
Monthly Turnover (pp)	51.1	12.7	16.1
Portfolio Size (USD)	68,795	47,334	68,360

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Retail Investor Behavior across Countries

Behavior	US	Taiwan	Others
Excessive trading	Barber & Odean (2000)	Barber et al. (2009)	China: Chen et al. (2004) Finland: Grinblatt & Keloharju (2009) Germany: Dorn & Huberman (2005) Sweden: Anderson (2008)
Disposition Effect	Odean (1998)	Barber et al. (2007)	Australia: Brown et al. (2006) China: Feng & Seasholes (2005) Finland: Grinblatt & Keloharju (2001) Israel: Shapira & Venezia (2001) Sweden: Calvet et al. (2009)
Sensation Seeking/Gambling	Kumar (2009)	Gao & Lin (2015)	China: Liu et al. (2022) Finland: Grinblatt & Keloharju (2009) Germany: Dorn & Sengmueller (2009)

So do day traders: Taiwan (Barber et al, 2014, 2020), Finland (Linnainmaa, 2005), Brazil (Chague et al. 2019, 2024)

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Performance by Trade Type

Panel A: Holding Period Returns (bps, Normalized to Daily Returns)

	Day trades (1 day)	Intended day trades (1 day)	Non-day trades (Open trades, 10 day hold)	Non-day trades (Open trades, 30 day hold)	Non-day trades (All trades, 10 day hold)	Non-day trades (All trades, 30 day hold)
Average investor/day	34.90	11.37	-0.99	-0.07	-1.30	-0.94
Aggregate investor/day	18.69	-4.99	-0.33	0.06	-1.03	-0.93
Average investor/year						
Day traders only	33.05	2.49	-2.60	-1.22	-2.42	-1.63
Non-day traders only	–	–	-1.01	-0.36	-1.78	-1.29
Aggregate investor/year						
Day traders only	17.51	3.58	-0.35	-0.37	-0.96	-1.01
Non-day traders only	–	–	-0.16	0.21	-1.13	-0.90

Panel B: Returns X Minutes after Trade (bps)

	Day trades	Intended day trades	Non-day trades (New trades)	Non-day trades (All trades)
Average investor/day				
Return 0 min	3.50	3.01	6.11	6.45
Return 30 min	9.96	6.02	-2.55	-2.01
Return 90 min	16.01	8.53	-8.15	-4.21
Return to close	17.57	9.01	-13.28	-5.35
Aggregate market/day				
Return 0 min	-0.88	-1.38	1.94	1.66
Return 30 min	7.36	5.47	-2.53	-2.40
Return 90 min	9.51	6.20	-8.27	-4.91
Return to close	7.52	5.28	-13.40	-5.27

- Sample: all traders during May 2016 to Apr 2017

Additional Analysis I

- No contemporaneous relationship between aggregate monthly day trading volume and volatility
  - past monthly return does not predict monthly day trading volume
- Performance decline not due to stock picking:
  - Use open to close price to compute return and find no results
  - Investors typically trade the same stock
- Order aggressiveness defined by order price and bid-ask price does not increase post reform
- Sensitivity to earnings surprises increases post-reform $\rightarrow$ suggest day trading does introduce noise
- Among traders with 2 trade a day, disposition effect increase by roughly 15 bps
- Facts to know
  - average treatment investor makes annualized 24 day trade in the pre-reform period

Additional Analysis II

- Share of new day traders does not significantly increase around reform. but given our sample construction, a lot of day traders are not captured
- Performance measured by return 60/90 minutes after a trade (either buy or sell) also decline by 2 bps
  - this measure ask "could the investors have improved performance by delaying trading"
- If define treatment and control using the classification period, we get a larger treatment effect on volume (other results are similar)
- Realization Rate of day trade is 77% and tax cut increase it by 1 pp
- To make sure our results are not driven by how are given more weight to more frequent traders, I also tried reweight by invesrse of number of trading day or collapse into two period for each investor. The benefit of doing the original way is being able to include day FE.
- Why round number trades perform worse? these trades earn lower bid-ask spread, and sits in the order book for longer (more adverse selection)
- For financial impact, to make sure effect not driven by small portfolio, I winsorize at 1%