“Smart(Phone) Investing? A within investor-time analysis of new technologies and trading behavior”

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How does FinTech impact households?

Bright side

- FinTech has potential to improve household spending, savings, debt management, and investment decisions
- **Emerging evidence robo-advisors can improve trading behavior, especially among the least sophisticated...** *(D'Acunto Prabhala & Rossi 2019)*
  - ... similar to literature on early innovation: TDFs *(Chalmers & Reuter 2020; Mitchell & Utkus 2020)*
- May increase engagement with financial services industry
  - Introduction of online advice tools increases online and in-person advice seeking *(Reuter & Richardson 2017)*

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Dark side

- Smartphone trading apps have potential to reduce quality of investor portfolios through low-cost, always-on access to markets, especially those with social/gamification
- **Existing evidence that introduction of online tools results in more frequent, less profitable trades** *(Barber Odean 2008; Choi, Laibson, Metrick 2002)*
- (Aggregate) trading on Robinhood associated with lower future returns *(Barber et al. 2020)*

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- **As of today, my return on Gamestop (GME) is -47.4%**

Research Question in this Paper

How does introduction of smartphone trading apps by two large German banks change retail investor trading behavior... and for how long?

Authors highlight two possible effects:

1. Apps **fundamentally change behavior** → expect increased demand for assets with lottery-like payoffs... or the opposite (due to more frequent feedback on losses)
2. Apps respond to **latent investor demand** → Question of when trading behavior changes rather than if it changes

My prior? Buy-and-hold strategies are doomed

Empirical Strategy

- Bank A introduced its app in **2010**; Bank B in **2013**
- Analyze trade-level data on what asset is **purchased** and whether trade is made through **app or computer**
  - **~150,000** investors in sample, **~18,000** trade on app
  - (Eventual) app users are different from nonusers
    - *Younger and higher % male*
    - ***Twice as many trades/month (10.0 vs 5.3)***
    - ***Pre-existing preference for volatility, lottery stocks, etc.***
  - *Do not observe trading outside of banks (e.g., Trade Republic)*
- To sidestep concerns about selection into use of app, authors advocate **"within investor-time analysis"**

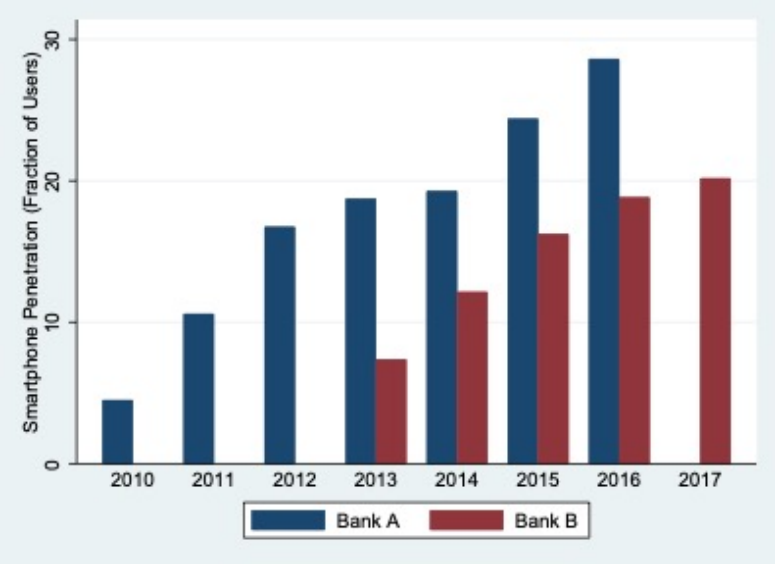
Empirical Strategy (2)

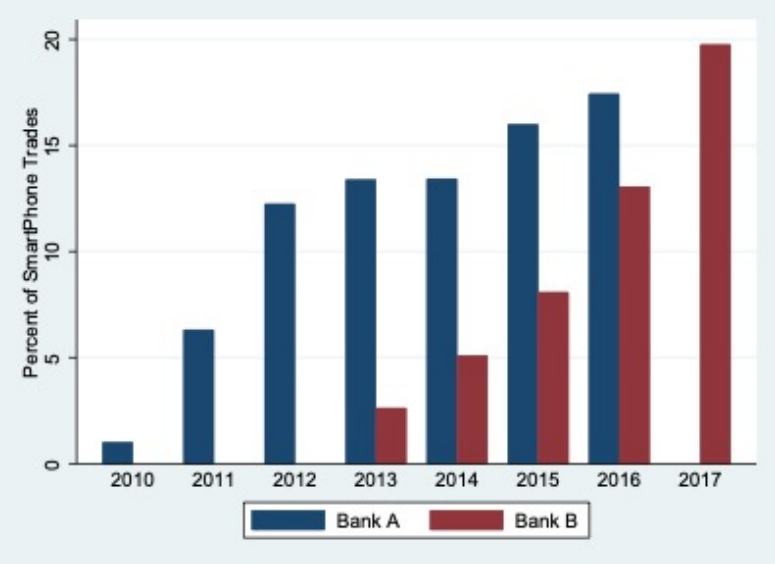
- Preferred specification regresses asset trait (e.g., volatility) on *app* dummy and *investor-by-month FEs*
  - Coefficient on *app* measures incremental volatility of assets purchased on app relative to assets purchased on computer *by same investor within the same month*
  - If investors continue purchasing same types of assets on computer, measures change in demand due to app
  - Investors who never use app are excluded by design, but so are investors who stop trading on computer, or trade on app and computer in different months → *estimates driven by subset of dual-use investors and will overweight behavior of investors who trade the most*

Smartphone Usage

Five years after introduction of app...

- **~ 20%** of clients used app at least once to trade → "Smartphone user"
- Between **14%** and **20%** of trades by Smartphone users are made via app





Data Filters

Two biggest changes come from (a) excluding sales and (b) limiting to years following introduction of app

Sample	# Investors	# Trades	Trades per Investor	Mean Balance	Median Balance
Full sample, 1999-2017	**225,000**	**65 million**	**288.89**	**50,228**	**16,388**
After limiting to purchases	225,000	40 million	177.78	50,228	16,388
After limiting to 2010-2016 for bank A and 2013 to 2017 for bank B	155,000	12.5 million	80.65	58,544	18,522
After dropping trades without asset info	155,000	11.9 million	76.77	58,699	18,862
After dropping savings plans and wealth management plans	**152,000**	**9.4 million**	**61.84**	**59,498**	**20,861**
Investors who use app at least once	18,000	3.6 million	200.00	57,877	17,543
Investors who do not	134,000	5.8 million	43.28	59,716	

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Difference in trades/investor → app users become much more active (which is not something authors' empirical strategy can measure)

Outcomes

Most tables focus on following asset characteristics:

- 1 if purchase risky asset?
- Volatility and skewness (past 12 mo.)
- 1 if lottery-type asset? (below-median price, above-median volatility, and above-median skewness)
- 1 if "Underdiversification?" → individual security
- 1 if past winner? 1 if past loser? (past 12 mo., within asset class)

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My main reoccuring comment: Authors do not examine how assets purchased differ from assets sold or from remaining portfolio → open question how much portfolio is changed/harmed by app

Main Results

Within sample of app users, **assets purchased on app are riskier** than assets purchased on computer, both overall and within investor-month

Fixed Effects	Volatility	Skewness	Lottery-Type	Underdivers.	Past Winners	Past Losers
None	**10.6%**	**15.1%**	**7.8%**	**48.4%**	**13.6%**	**8.8%**
	(18.51)	(7.98)	(10.18)	(24.78)	(11.24)	(11.10)
Investor-by-Month	**7.4%**	**10.5%**	**5.6%**	**40.6%**	**8.7%**	**6.6%**
	(22.55)	(10.08)	(12.34)	(18.45)	(14.19)	(14.58)
Investor-by-Month	**4.5%**	3.9%	**2.9%**	**48.1%**	**7.7%**	**3.6%**
(Limit to main bank)	(7.49)	(1.74)	(3.68)	(9.40)	(4.70)	(3.73)
Investor-by-Day	**2.3%**	1.8%	**1.6%**	**15.1%**	1.4%	1.3%
	(8.56)	(1.69)	(2.43)	(6.54)	(1.84)	(2.01)

Bold coefficients are statistically significant at 1% level

Unclear why magnitudes fall when focusing on investors for whom Bank A or B is main bank or when including investor-day FEs

Substitution?

Authors would like to interpret coefficient on *app* as increased risk-taking due to introduction of app

- **Potential concern:** Before the app, I purchased risky and non-risky assets on my computer. Now, I purchase risky assets on the app and non-risky assets on my computer
- **Authors' response:** Estimate difference-in-difference specification comparing **non-app trades** of app users to **non-app trades** of future app users → stronger evidence of spillovers than substitution
- Exploiting staggered rollout of iOS vs. Android → no substitution

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Again: Because we ultimately want to know how much portfolio risk and return are changing, I would also like to see changes in portfolio characteristics for early adopters vs. late adopters

Mechanism?

Next, the authors ask whether main results hold when controlling for asset class or time of day

	Difference in risk		Probability purchase asset that is...			
Fixed Effects	Volatility	Skewness	Lottery-Type	Underdivers.	Past Winners	Past Losers
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	(22.55)	(10.08)	(12.34)	(18.45)	(14.19)	(14.58)
Investor-by-Month	**2.2%**	**2.4%**	**2.4%**		**1.1%**	**2.2%**
Asset-by-Year FE	(13.30)	(5.65)	(7.12)		(3.08)	(7.26)
Investor-by-Month	**2.5%**	**4.7%**	**2.1%**	**11.3%**	**2.4%**	**2.0%**
Trade Hour-by-Year FE	(10.10)	(5.91)	(3.62)	(7.05)	(4.05)	(3.90)

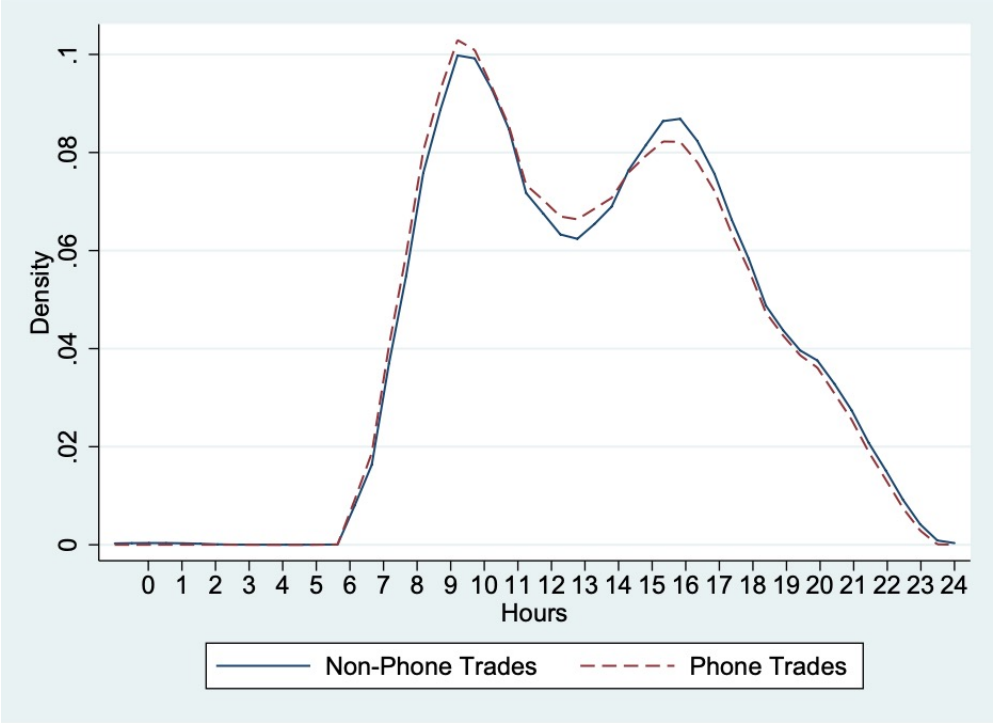
Answer is “yes” but economic significance falls

I would have included investor-month-asset class or investor-month-trade hour FEs... but begs question about **why (and how many) investors would trade the same asset or during same hour on both app and computer?**

Trading: Apps versus Computers?

Density of app and computer trades within sample of app users reveals app trades more likely during normal work hours and less likely after work hours...

... but differences appear quite small



Apps and Impulsive Trades?

- Kahneman (Thinking, Fast and Slow) argues that people are more like engage in implusive/intuitive “System 1” thinking “during times of ego depletion or elevated moods”
- Authors’ find app effects are larger before lunch (fatigue) and on days with more sunshine... although any differences are modest
- **Fundamental tension:** authors argue likelihood of System 1 thinking depends on time of day or amount of sunshine...
- ... but estimation compares app and computer trades made during same circumstances (e.g., on sunny days in month t)
- **Might have expected app trades to concentrate at certain times but that is not what we just saw**

Persistence and Heterogeneity?

- Authors estimate a dynamic model: **coefficient on *app* is stable over 8+ quarters** following first app trade
  - ***Lack of learning is striking.*** *Is set of investors trading on both app and computer growing or shrinking over time?*
- Sample skews older, more experienced than Robinhood
- To shed light on heterogeneity, authors re-estimate baseline specification separately for "new investors" (below median tenure at their bank) and "old investors"
  - Estimated effects are uniformly lower for old investors, but economically similar (e.g., **2.7%** for lottery asset vs. **3.3%**)
  - Minor: How about splits based on income and wealth?

Overall Significance to Investors?

Standard approach would be to estimate both intention to treat (ITT) and treatment on the treated (ToT)

- Would allow us to learn more about changes in trading frequency and aggregate changes in risk-taking and performance

Authors' approach controls for time-varying investor traits but ignores two groups of investors

1. 100% computer trades → **Ignored** (important for ITT estimates)
2. Switch 100% to app → **Ignored** (could be largest treatment effects)
3. Mixture of app and computer trades → assets purchased on apps are **more lottery-like** and have **lower Sharpe ratios** than assets purchased on computers... highly suggestive but I really want to see some evidence on cumulative effects

Dead Horse?

As complement to existing analysis, I would like to learn more about how portfolio equity exposure and performance evolve with Smartphone trading

- Ex. 1: App user has $200,000 in a retirement account, which she does not trade, and $10,000 in retail account that rotates between a few lottery stocks → overall impact limited
- Ex. 2: App user replaces index funds with active funds
- Ex. 3: App user slowly transitions from diversified portfolio to 60% Gamestop, 40% Tesla

Relatedly, I would like to learn more about what assets are being sold via app and when... hard to interpret Sharpe ratio of buy without knowing Sharpe ratio of sale

Conclusion

- Authors use data on millions of buys to document negative effect of app on trading within sample of German investors
  - In absence of gamification, they find increased demand for risky assets, especially those with lottery-like payoff
  - Moreover, preferences spill over to trades via computer and persists for 8+ quarters

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- Authors use data on millions of buys to document negative effect of app on trading within sample of German investors
  - In absence of gamification, they find increased demand for risky assets, especially those with lottery-like payoff
  - Moreover, preferences spill over to trades via computer and persists for 8+ quarters
- Complements earlier evidence that online trading tools are detrimental to investor welfare... but does not yet present a complete picture
- Does not have anything to say about value of robo-advice or possible interaction between robo-advice and apps