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WHO FALLS PREY TO THE WOLF OF WALL STREET? INVESTOR PARTICIPATION IN MARKET MANIPULATION

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ABSTRACT

Price distortions created by so-called "pump-and-dump" schemes are well known, but relatively little is known about the investors in these frauds. By examining 470 "pump-and-dump" schemes and a large data set of trading records for over 110,000 individual investors from a major German bank, we provide comprehensive evidence on the participation rate, magnitude of the investments, the losses, and the characteristics of the individuals who invest in such schemes. Participation is quite common with nearly 8% of active retail investors participating in at least one "pump-and-dump" losing on average nearly 30%. Next, we identify several distinct types among participating investors, some of which (i.e., speculating day trader) should not be viewed as falling prey to the schemes. Recognizing this heterogeneity is key when designing investor protections because we find investor types respond differently to market manipulation. We also show that portfolio composition and past trading behavior better explain scheme participation than demographics. Lastly, we document longer-lasting effects on participating investors that go beyond the immediate financial losses.

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1. Introduction

Well-functioning equity markets are predicated on access to reliable and accurate information. There are many information sources that investors can utilize in their decisions including disclosures issued by firms, news conveyed by information intermediaries (e.g., financial analysts, journalists), social media (e.g., Reddit, Twitter) and information contained in prices themselves. Manipulation of any of these sources of information can create distortions that undermine market functioning, efficient capital allocation, and individuals' willingness to invest in the stock market (e.g., Aggarwal and Wu 2006; Kyle and Viswanathan 2008; Giannetti and Wang 2016).

Given these distortions and potential externalities, securities regulators mandate truthfulness in disclosures and take action against those who seek to deceive. Regulators also prohibit deceptive trading practices and market manipulation with the intention to protect investors. For example, the U.S. Securities and Exchange Commission (SEC) describes its mission as one "to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation" (SEC 2016). However, these objectives, especially investor protection and facilitating efficient trading, can compete with each other.[1] Therefore, making appropriate tradeoffs between them requires understanding the trading behavior of individual investors that the SEC seeks to protect.

There is a significant body of work examining the role of disclosure and securities regulation in fostering capital formation and market quality (e.g., Leuz and Wysocki 2016 for a survey), but much less research on even the most basic questions related to market manipulation and investor protection. What is the participation rate in manipulative schemes? How damaging is market manipulation to investors' portfolios? To what extent do investors "fall prey" to manipulation, rather than seek out manipulated stocks? This knowledge gap likely comes from the scarcity of

[1] Similarly, lowering firms' regulatory burden can foster capital raising in public markets, but also makes it more likely that investors face duplicity in market transactions and lower market quality (e.g., Brüggemann et al. 2018).

transaction-level data, especially for representative samples. Yet, these questions have recently received considerable attention as policy makers consider the role of individual investors in the price formation process following the growth in "meme" stock trading (e.g., GameStop, AMC) and the recent surge in penny stock trading (Phillips 2021).[2]

In this paper, we provide evidence on these questions by analyzing retail investor participation in "pump-and-dump" schemes for a reasonably representative sample. In such schemes, a promoter acquires a position in a stock and then artificially raises the price by disseminating false or misleading information about the firm, which is why these schemes are also called "touts" (Kyle and Viswanathan 2008; Putnins 2012). To facilitate a rapid run-up in price during the pump phase, promoters often target more thinly traded stocks, for which limited liquidity leads to fast price increases when demand rises. Once the stock has appreciated, promoters sell their shares causing a rapid share price decline and significant losses for other investors.

Pump-and-dump schemes harm investors who purchase shares on the false premise that some innovation or impending development justifies a rising valuation. Harm could spread further if those investors come to distrust information about other stocks and, more generally, lose trust in the stock market (Antweiler and Frank 2004; Guiso et al. 2008; Giannetti and Wang 2016; Soltes 2016). Regulators expend considerable resources seeking to curtail market manipulation to mitigate these adverse effects. Yet, an effective regulatory response requires understanding who invests in such schemes and why, as well as a sense of how investors fare in them.

Towards such an understanding, we examine actual participation in pump-and-dump schemes using a novel data set of such schemes provided by the German supervisory authority, BaFin, supplemented with an extensive hand-collection of cases. We combine these schemes with trade-

[2] For a summary, see the U.S House Committee on Financial Services in "Game Stopped? Who Wins and Loses When Short Sellers, Social Media, and Retail Investors Collude" (February 18, 2021).

level data, holding and portfolio records for over 110,000 retail investors from a major German bank. This sample is a reasonable representation of the population of German retail investors.[3] These granular data not only allow us to assess trading returns of participating investors, but also enable us to study their characteristics, their trading behavior and investment portfolios. This combination of data is unique in the literature and does not exist outside of our setting.

We find 8,584 individuals making nearly 30,000 purchases during the first 60 days of the 470 pump-and-dump schemes in our sample. We confirm using matching and regression-discontinuity designs that these investors indeed respond to the touts. Thus, nearly 8% of the investors in our sample invest in at least one pump-and-dump scheme. Moreover, in any given year, there is roughly a 2% chance that a sample investor would take a position in at least one tout campaign. These participation rates are surprising considering that our sample covers regular (online) brokerage accounts. Thus, investing in pump-and-dump schemes is fairly common.

Investors put on average €6,449 into a tout, which is sizeable relative to their average portfolio value (11.2%). By comparison, the average investment outside pump-and-dump schemes for these investors is €6,027. Compared to a random sample of active investors who do not invest in pump-and-dump schemes, tout investors hold a greater number of individual stocks, and have a higher portfolio share of penny stocks and a lower share of blue chip stocks. Importantly, investors' personal characteristics such as age or profession have relatively low predictive power for tout participation compared to portfolio characteristics and past (non-tout) trading behavior.

Participating in pump-and-dump schemes results in considerable losses with the average (median) return being -28% (-27%). This return, however, is less than what the price path of many

[3] We compare our sample to a few other studies with individual investor data (e.g., Barber and Odean 2001; Dorn and Huberman 2005; Calvet et al. 2007) as well as aggregate statistics, and find that our sample is quite comparable in terms of age, gender, portfolio value, etc. See Section 2.

schemes would suggest. The median 120-day holding period return for a pump-and-dump is -67%. Thus, investors curb their losses by selling their tout investments early instead of holding them through the dump period. This comparison illustrates that it is important to study outcomes at the trade and investor level. Aggregating losses across sample investors and assuming that investors at other online banks behave similarly, we estimate that the *average* tout generates losses of at least €1.45 million in Germany.[4] As a reference point for the magnitude of these losses, the median financial fraud that is criminally prosecuted in the U.S. generates damages that are roughly half of our aggregate loss estimate for the median tout. When converted to U.S. dollars, the above estimate for the average tout roughly equals the 90th percentile of the damages caused by financial frauds prosecuted in the U.S. ($1.75 million). This comparison illustrates that pump-and-dump schemes are not minor violations, but constitute sizeable financial crimes, consistent with them attracting considerable attention of both civil and criminal regulatory authorities.[5]

Given the negative returns of tout investments, it is surprising that we find a considerable number of individuals investing in more than one tout. Roughly 15% of tout investors place money in four or more touts during the sample period. These multi-tout investors perform less poorly in their initial tout investments, but they still lose on average 24% across all their touts. They place larger-than-average investments and have a large fraction of penny stocks in their portfolios. The frequency with which some investors invest in touts as well as the composition of their portfolios provide a first indication that not all tout investors are deceived by or fall prey to pump-and-dump schemes. Instead, it appears that some investors even seek out pump-and-dump schemes.

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[4] Touts are often international and target investors in many countries. This estimate also excludes losses to German investors with brick-and-mortar accounts.

[5] Deason et al. (2015) describe considerable variation in the magnitude of losses associated with another type of deceptive scheme known as "Ponzi Schemes." They find that losses in most schemes are considerable smaller than in the "headline grabbing" Madoff-like frauds.

This novel finding is important from the perspective of investor protection. We therefore dig deeper into the heterogeneity of investor motives. We classify investors into different types based on their past trading behavior in *non-tout* stocks. We then assess how the likelihood of *tout* participation differs across investor types. We find that 20% of the tout investors are day-trading in stocks or are frequent traders with short investment horizons. Day and short-term traders are not only more likely to invest in touts, leave the tout early, but also place larger bets and have better returns. Their tout investments look different from those of other investors, especially more conservative traders, who trade infrequently and typically do not invest in penny stocks. This latter group is more likely to comprise investors who were tricked into the schemes.

To illustrate that these differences in investor types (or motives) indeed matter, we explore whether all investors are similarly receptive to regulatory intervention aimed at protecting investors. We focus on a sample of pump-and-dump schemes for which BaFin published warnings about ongoing fraudulent promotions. Using a difference-in-differences and a regression-discontinuity design, we find that trading decreases sharply after BaFin releases its public warnings. However, these effects are mostly concentrated among "regular" traders and do not seem to have much of an effect on day or short-term traders. This evidence highlights that recognizing the heterogeneity among investors is important for effective investor protection (e.g., warning signs are less likely to work for investors with gaming motives).

An important question from a policy perspective is whether the tout experience has longer-lasting effects on investors that go beyond the significant financial losses from the respective pump-and-dump investment. We study this issue along two dimensions. First, we examine investment behavior with respect to future touts *conditional* on the prior tout experience (or return). Specifically, we find that investors with more positive returns invest more frequently and more quickly into the next tout, and they stay in it for longer. Second, we study long-run effects on

investor portfolios and investment behavior after a pump-and-dump experience. This analysis gauges the broader effects of manipulative schemes and connects with the literature showing that investors' life-time experiences can shape their future financial risk taking (e.g., Malmendier and Nagel 2011 and 2016). We use a generalized difference-in-differences design with matching and an extensive fixed effect structure to tease out that participating in a pump-and-dump scheme has a lasting effect on future investment behavior, especially for investors who were likely deceived by the scheme. We find that regular investors that experience a pump-and-dump scheme reduce their investments in relatively safer assets, such as blue-chip stocks or mutual funds, and are more likely to exit the stock market altogether. Thus, pump-and-dump schemes have consequences for capital market participation beyond their immediate financial impact.

Overall, our analysis provides a multi-faceted picture of investor behavior with respect to market manipulation. First and foremost, we present novel trade-level evidence on investor trading in manipulated stocks. Individual investor data are rare and prior research using such data primarily characterizes investment biases (e.g., Odean 1999; Barber and Odean 2000, 2013; Schmittmann et al. 2014; Fecht et al. 2017; Loos et al. 2020). We show that participation in pump-and-dump schemes is fairly common and that individual and aggregate losses are considerable. More broadly, our transaction-level analysis sheds light on retail investor behavior when it comes to (very) risky investments that have lottery-like payoffs (e.g., Kumar 2009). Such analyses are rare, but the GameStop and other meme stock trading episodes illustrate the importance of understanding retail investor behavior (e.g., Barber et al. 2022; Eaton et al. 2022; Welch 2022).

Second, our study contributes to the literature on investor protection. Prior work in this area examines the impact of accounting or financial fraud on firms (Karpoff and Lott 1993; Karpoff et al. 2008b), managers (Karpoff et al. 2008a), and investors (Guiso et al. 2008; Giannetti and Wang 2016; Miles and Pyne 2017; Egan et al. 2018; Gurun et al. 2018). There is much less work on

market manipulation. Our findings highlight considerable heterogeneity (or types) among investors participating in pump-and-dump schemes. Not all of them fit the popular image of vulnerable investors. A sizeable fraction of investors seems to gamble with tout stocks, rather than to be successfully duped by aggressive promoters. Moreover, we find that demographics provide only very limited insights into who participates in pump-and-dump schemes. Instead, portfolio characteristics and past trading behavior are much more predictive and connected to trading motives and investor types. Both these insights are important for securities regulators. For instance, they could exploit trade-level data, e.g., from the Consolidated Audit Trail that the SEC recently introduced, to better understand which investor types participate in certain stocks, and then adjust their interventions accordingly. As we show, investor types respond quite differently to supervisory warnings about manipulative schemes. Educational efforts are unlikely to have much of an effect on individuals who knowingly invest in pump-and-dump schemes. Moreover, these investors essentially create externalities with their trading. They drive up prices in the pump phase, which not only fuels the bubble but also makes the schemes more profitable for promoters. Thus, understanding investor heterogeneity is likely critical for effective investor protection.

Finally, our evidence on long-run, post-tout investment behavior contributes to the literature examining how market experiences can shape future behavior (e.g., Laudenbach et al. 2020). Specifically, it underscores the concern that manipulation and fraud can have negative externalities with respect to trust and individuals' willingness to invest in the stock market, as also shown in Giannetti and Wang (2016) and Gurun et al. (2018). Together, these studies speak to the important question of why regulators aim to protect investors and curb market manipulation (e.g., Aggarwal and Wu 2006; Kyle and Viswanathan 2008; Giannetti and Wang 2016).

2. Stock Touts and Investor Behavior

2.1. Stock Touting and Pump-and-Dump Schemes

Since the creation of the earliest stock companies, individuals have been deceptively promoting specific stocks.[6] Despite the growth in regulation over time to combat deceptive enterprises and fraud, market manipulation continues (Allen and Gale 1992; Jiang et al. 2005; Khwaja and Mian 2005). Putnins (2012) characterizes manipulative schemes as market-power based (e.g., "corners," "squeezes"), contract-based (e.g., "marking the close," "capping"), or information-based (e.g., "pump-and-dump"). We focus on information-based pump-and-dump schemes. Such schemes distort trading in and market prices of the underlying stocks and hence are a form of illegal market manipulation according to the definition of Kyle and Viswanathan (2008).[7]

In the typical pump-and-dump scheme, a promoter begins by purchasing stock in a thinly traded firm. Promoters tend to focus on stocks that trade at low share prices, commonly referred to as penny stocks. Most of these securities trade on over-the-counter or alternative markets (e.g., the German Open Market, the U.K. AIM, or the U.S. OTC Markets, formerly known as the Pink Sheets), which are less regulated than the major exchanges (Aggarwal and Wu 2006; Brüggemann et al. 2018). The relatively light regulation and low liquidity of these markets facilitate more effective "pumping." Moreover, even when a severe mispricing is identified, low liquidity makes arbitrage difficult. "Wash trades" among perpetrators in advance of the actual schemes allow them to manufacture the appearance of rising stock prices and deep markets. Together, these factors make OTC and alternative markets a frequent breeding ground for promoters to engineer deceptive

[6] As one of the earliest examples, the South Sea Company created the appearance of a highly desirable stock by publicly distributing it to influential people who spread rumors of overnight fortunes (Voth 2016). Investors rushed to purchase stock and within three months it soared from 330 to 1,050 pounds. The bubble burst three months later as the price fell by more than 80% leaving investors with worthless stock and creating a national economic crisis.

[7] We also provide the relevant legal definition for this form of market manipulation in Section 3.1.

schemes (Griffin and Block 2001; White 2016; Renault 2018).

To increase interest in the stock, promoters often concoct a story about impending news or innovation that would lead to a dramatic increase in firm value. The promoters then circulate this information through e-mail, newsletters, message boards, or other promotional communications to potential investors. As an example, in one tout from September 2007, a promoter e-mailed:[8]

> *We are glad to inform you of a CANCER CURE invented by ANDOVER MEDICAL INC (ADOV) that will take the world by storm. This new medicine, is above all other and boosts a 80% success rate during clinical trials*
>
> *Over the next few days you will hear about this in the PAPERS and on TV.*
>
> *So buy shares now, while price is low, before the news hits.*
>
> *ANDOVER MEDICAL INC (ADOV) $.45*

At the beginning of the period of promotion and touting, the price of the stock typically rises as investors increasingly purchase shares in anticipation of the good news being realized. Once the campaign ends (or even during the campaign), promoters sell their holdings, which in turn is often the beginning of a precipitous decline in the stock. This pattern of promotion and rapid price increase followed by a steep decline in price fits the name to describe such schemes.

As with other attention-grabbing news about firms (Lee 1992; Barber and Odean 2008), investors react to information touted by promoters. Several prior papers examine promotional communications and find that stock touts generate significant trading volume and distortions in market pricing using stock-level data. Frieder and Zittrain (2008), for example, show that trading volume rises dramatically during periods of heavy touting.[9] Relatedly, Böhme and Holz (2006) find significantly positive abnormal returns on the day of the tout for over 100 stock spams. Nelson

[8] We focus on pump-and-dump schemes which were pushed in German markets. Therefore, promototions in our sample were mostly in German. However, as explained in the internet appendix, we include English stock spams if they also targeted German investors or markets.

[9] Similarly, in 2021, several "meme stocks" were suddenly among the most traded in U.S. markets after they were promoted on Reddit and similar platforms in the recent GameStop saga (e.g., DeCambre 2021).

et al. (2013) find that stock spams that are bundled with ostensibly more credible information also tend to have greater market impact.[10] However, as these studies rely on stock-level data, their insights with individual investor trading and losses are limited.

Although the deceptive practices utilized by promoters to create pump-and-dump schemes are not themselves new or innovative, the cost of engineering such schemes has declined dramatically by recent technological advances. Promotional campaigns once required telemarketers, boiler rooms, or physical mailings to reach potential investors, but now promoters can rely on inexpensive e-mail lists. One estimate from the security firm Sophos suggests that, in 2007, stock spam rose to 25% of all unsolicited e-mail (Sophos 2007). In recent years, promoters have been also leveraging social media as an additional cost-effective channel to tout their stocks (e.g., Twitter or Reddit). For instance, Renault (2018) analyzes stocks promoted on Twitter and finds pump-and-dump trading patterns for them. Similar, patterns can also be found in crypto assets (e.g., Dhawan and Putniņš 2022).

To provide an example of a pump-and-dump campaign, Figure 1 displays the price path for BAR.bra Mining Group AG from December 5 to December 31, 2008. The company was allegedly a mining company extracting precious metals and rare earths with operations in Mongolia and Ghana. Beginning around January 10, 2008, promoters advertised the company in several newsletters, mentioning the surge of the stock price since its launch in Frankfurt's Open Market as well as highlighting the firm's tremendous growth potential.[11] The stock continued to rise by

[10] Renault (2018) examines the potential for social media (Twitter in particular) to foster market manipulation and create pump-and-dump schemes. He finds that abnormally large message activity is associated with price movements consistent with pump-and-dump schemes in those firms and suggests that these price changes are rooted in manipulative promotion rather than over-optimism by investors.

[11] Touted stocks often have an upward sloping price path just before the actual beginning of the promotional campaign. One likely reason is that perpetrators, who often control most of the outstanding shares before the tout, use wash trades to create an appearance of rising prices and an illusion of market liquidity in advance of the actual scheme. For example, the SEC complaint related to the Amogear pump-and-dump case (Litigation Release No. 23041) provides rich details on the behind-the-scenes planning of such a scheme. The FBI secretly recorded several

26% over the next five days until the price reached it its peak (€0.87) on January 15, 2008. As the dump phase began, the stock lost 67 percent of its value (€0.29) in less than a week. Roughly three months later, the stock was essentially worthless (€0.04).[12]

2.2. Investors and their Investments in Touted Stocks

Although the price path of touted stocks suggests that pump-and-dump campaigns can be effective, little is known about the investors who trade upon receiving a promotional communication. From a regulatory perspective, understanding who responds, why they respond and whether there are different motivations or investor types is central to regulators' efforts to protect investors and reduce the impact of manipulative schemes. Media articles discussing the risks of pump-and-dump schemes offer anecdotal evidence suggesting that those who fall prey to these schemes are vulnerable investors who believe the touted information is truthful and are taken aback when it is revealed to be otherwise (e.g., Sterbenz 2014; Antilla 2016). Put differently, these investors are deceived by the schemes and unaware of their risks.

However, it is not clear that all investors fall prey to pump-and-dump schemes.[13] Some investors may invest in high-risk or penny stocks because they view them as lotteries and as a form of gambling (Dorn and Sengmueller 2009; Dorn et al. 2014; Gao and Lin 2014; Chen et al. 2021). These investors are looking for legitimate stocks that potentially generate large returns, albeit with

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discussions between the perpetrators and one discussion related to pre-tout trading is summarized as follows: "*The trades they discussed were to be rigged trades between participants in the scheme to manipulate Amogear's stock price in which the participants would trade with and among accounts they controlled to create the appearance of a false market. [The defendants] discussed the 'cross trades' and the plan to follow the trades with false touting.*" Along the same lines, it is likely that the initial price for BAR.bra Mining Group is inflated, e.g., by placing the stocks with insiders.

[12] According to newspaper reports, the premises of the promoters were searched by police in 2012 in connection with the BAR.bra Mining Group tout as well as eight other promotional campaigns (Reimann and Reimer 2012).

[13] Why investors succumb to schemes that contain unsubstantiated or even outlandish claims has gained considerable attention in the behavioral ethics literature. Chugh and Bazerman (2007) argue that people have bounded awareness, which limits individuals' ability to appropriately incorporate accessible and relevant information into their decision-making processes. For a broader overview of the behavioral ethics research regarding why individuals overlook deceptive conduct, see Bazerman and Tenbrunsel (2011) and Gino (2013). Frankel (2012) describes the victims of financial fraud by examining those that fall prey to Ponzi like investments.

high risks. Such investors may accidentally invest in a pump-and-dump scheme when seeking high-risk, high-return payoffs. It is also conceivable that some investors participate in pump-and-dump schemes in order to profit from the schemes. These individuals are not duped by the promotional communication, but rather consciously decide to invest despite knowing the nature and risk of the investment. For example, a 2014 *Bloomberg* article describes a 27-year-old telecom broker named Matthew Fromm who often traded stocks in his spare time in the evening (Faux and Lawrence 2014). He often invested in touted penny stocks noting that "the trick with trading penny stocks is being ahead of the curve." Fromm labeled these "Lotto Picks", indicating that he hoped to reap a large gain, but also understood that his initial investment might be worthless in the end. Thus, some investors are attracted to touted penny stocks, because of the skewed payoffs and/or utility gain from investing in risky equities (Kumar 2009; Eraker and Ready 2015). Given the more deliberate involvement, it is also much less clear that these investors can or should be protected by securities regulators. This view recently gained traction during the GameStop saga. After brokerages suspended trading in GameStop and other speculative "meme stocks" (citing high margin requirements), several US lawmakers criticized these trading limits. Legislators argued that retail investors should have the same ability to purchase risky and speculative stocks as more sophisticated investors (Lerer and Herndon 2021).

Prior research on market manipulation provides only limited evidence of the size of tout investments and the losses incurred by investors. Frieder and Zittrain (2008) assume investors purchase stocks when they are most heavily touted and hold them for two days. Based on these assumptions, they estimate that investors lose on average 5.4% in a tout investment before transaction costs. However, if investors entered earlier or held longer, their profits could be substantially different. Moreover, we do not know if investors place small bets or invest a significant fraction of their stock portfolios. Our study speaks to these questions.

3. Data and Research Design

For our analysis, we combine granular trading and portfolio data for a large and fairly representative sample of German retail investors with a data set of pump-and-dump schemes that were "offered" to German investors or "pushed" in German markets. Market manipulation is a global phenomenon and investors encounter pump-and-dump schemes in securities markets around the world.[14] In fact, the same schemes are often pushed in several countries at the same time. We simply focus on schemes that were promoted in Germany (and potentially elsewhere) because of our German investor data. The results should be relevant beyond Germany.

3.1. Sample of Pump-and-Dump Schemes

We collect data on stocks that were subject to explicit promotions from two sources. The first source is a proprietary sample of pump-and-dump schemes provided to us by the German Financial Supervisory Authority (BaFin). This agency is charged with supervising German securities markets and enforcing German securities laws. Restricting market manipulation is considered one of its main functions.[15] BaFin actively monitors German securities markets and also receives tips and complaints about manipulative schemes from investors and banks. It investigates these claims and determines whether the schemes constitute illegal market manipulation.[16] The characteristics of an illegal pump-and-dump campaign are summarized and described in Article 4 of MaKonV ("*other acts of deception*"). Under German law, it is prohibited (i) to tout or promote a stock based on false or misleading information or (ii) to provide deceptive stock recommendations that conceal

[14] Market manipulation is a phenomenon in both developed securities markets (e.g., the US and the UK) and emerging markets (e.g., Khwaja and Mian 2005).

[15] See Market Manipulation, BaFin, May 8, 2017 (available at: https://www.bafin.de/EN/Aufsicht/BoersenMaerkte/Marktmanipulation/marktmanipulation_node_en.html).

[16] Illicit market manipulation is prohibited in Germany according to Article 20a of the Securities Trading Act (*Wertpapierhandelsgesetz).* The definition of illegal market manipulation was revised in 2005 via an administrative order by the German Ministry of Finance (*Marktmanipulations-Konkretisierungsverordnung, MaKonV*). The law changed again in 2016 (i.e., after our sample period) due to changes in EU law.

the promoter's financial interests.[17] Cases that BaFin determines to be illegal market manipulation are handed over to the German prosecution.

From January 2002 to January 2015, BaFin identified 263 allegedly illegal tout campaigns that it handed over to German law enforcement.[18] This sample is comprehensive in that it includes all pump-and-dump schemes BaFin provided to prosecutors during this time period. BaFin generally does not consider the likelihood of apprehending the promoters or the likelihood of obtaining a conviction in determining whether or not to refer these cases to the prosecution. Thus, almost all cases that BaFin investigates and views as illegal are referred to the prosecution, and hence form part of our sample. Given BaFin's investigation, we are confident that the touts within this sample targeted German investors and took place in German markets. This feature matters because we have a sample of retail investors with accounts in Germany.

To mitigate potential sample selection concerns about tout campaigns provided by BaFin (e.g., related to the way BaFin identifies potentially illicit stock promotions), we create a second dataset by hand-collecting touts from German websites and internet forums. To find these additional cases, we conducted several searches. First, we examined stock trading websites that feature promotional communications and that allow users to post touts and spams. Second, we examined those trading websites for complaints by individuals about receiving unsolicited e-mail, telephone calls or other communication touting the stock (see Part A of the Internet Appendix for details on search process and examples). To ascertain that the incident described was a stock tout, we require that the individual provided either a copy of the tout text or a detailed description of the promotion. Based

[17] Stock ownership or other financial interest in a firm constitutes a conflict of interest that must be disclosed when recommending a stock. Insufficient conflict-of-interest disclosures can make a stock promotion illegal. Pump-and-dump campaigns are also illegal for other reasons ("*wrong and misleading signals due to an artificial price level*", Article 3 of MaKonV). For example, pump-and-dump campaigns often rely on wash trading to create an illusion of market activity and liquidity in advance of the scheme.

[18] Although BaFin viewed the schemes as illicit market manipulation, the touts would be accurately described as 'alleged market manipulation' because the legal determination is ultimately made by the prosecution and the courts.

on this strategy, we identify 327 distinct campaigns that occurred between January 2002 and January 2015. If the same stock is touted multiple times, we treat the subsequent tout as a new campaign if the two promotional communications are more than six months apart.

Combining the two sources results in 470 distinct pump-and-dump campaigns. There are 120 cases that appear in both subsamples. This overlap in the two subsamples may at first seem low, but recall that the BaFin sample is focused on manipulations that took place in German markets and for which BaFin asserted to have jurisdiction. For the hand-collected cases, it is less clear that German investors were specifically targeted, and these touts may have reached German markets more incidentally. Moreover, all BaFin cases were deemed illegal market manipulation by the supervisor. Our hand collection does not apply this criterion. In this sense, the hand-collected sample is less restrictive and could include promotions that were not necessarily illegal. Both subsamples have advantages and, for this reason, we combine them for our analyses. However, we confirm that our analyses yield similar results and inferences when using BaFin cases only.[19]

A key data item for our analysis is the beginning of the tout campaign (i.e., pump phase). For the BaFin cases, we rely on the date provided by the supervisor, which in most cases is the first of the month in which the illegal promotion activity started, according to their investigation. For the hand-collected cases, we define the beginning of the tout campaign as the date of the promotional communication, unless this date is not available in the actual message. In this case, we record the date of the post about the tout as the start of the campaign. When we find multiple posts or messages for the same tout campaign, we record the date of the first promotional communication.

[19] We also analyze systematic differences between the two subsamples (Table 1) and find that the primary difference is the "uptake" by our German sample investors along the extensive margin. This difference is consistent with our discussion above and the criteria based on which the two subsamples are constructed. In Part B of the Internet Appendix, we provide further descriptive statistics to more directly show that both subsample are comparable in terms of tout participation and investment performance.

For each pump-and-dump campaign, we collect additional descriptive information about the touted firm, the type and country of its trading venue, the location of its headquarters, and industry via historical snapshots of Datastream.

Figure 2 shows the number of touts per year in our BaFin sample, hand-collected sample, and those contained in both samples. From 2006-2014, there are on average 50 touts per year. In the earlier period, 2002-2005, we have far fewer touts in our sample, which could be explained by the gradual supervisory ramp-up.[20] In addition, we note a spike in the number of hand-collected touts in 2007. This spike is likely related to the following stock spam patterns. First, SEC enforcement with respect to 'hyped' Pink Sheets stocks (in particular, "Operation Spamalot" in March 2007) led to a significant rise in stock spam campaigns outside the US (e.g., Sophos 2008). Second, new spam technology ('image spam' or 'PDF spam') allowed perpetrators to bypass most anti-spam filters during that year. Third, time-series pattern of pump-and-dump schemes roughly coincides with bull-bear market cycles and German stock market returns. A plausible explanation is that perpetrators are more likely to create pump-and-dump schemes when new investors flock into penny stocks because of rising stock indices (see also race track evidence in Ramezani and Ahern 2022). Similarily, there was a recent spike in pump-and-dump schemes in U.S. penny stocks after the GameStop incident attracted investments by many retail investors (e.g., Phillips 2021).

We provide further descriptive information on these pump-and-dump campaigns in Part B of the Internet Appendix. In our sample, promoters disseminate tout campaigns via a variety of different communications. E-mail and newsletter, which provide stock recommendations to subscribers, are among the two most common means of distribution (Panel A of Figure B1). Touted

[20] BaFin was not formally charged with the supervision of market manipulation until 2002. A year later, its special organizational unit for the surveillance and enforcement of market manipulation came into existence and its legal authority with respect to market manipulation was further expanded in 2004 and 2005.

stocks are traded on venues in many different countries, with Germany and, to a lesser extent, the United States being the most common (Panel B of Figure B1). Similarly, tout firms have their headquarters in many countries, though 75% of the sample has their alleged headquarters in Germany, the United States or Canada (Panel C of Figure B1). We also find that touted firms are purported to be operating in a diverse set of industries (Panel D of Figure B1). Tout stocks are often in financial services (mostly holding companies), but mining, software, and oil & gas companies are also common. We note that alleged headquarter locations and designated industries can be deceptive. Touted firms are often shell companies and/or lack substantive operations. Industry and headquarter locations are rather chosen to tell an interesting story during the promotional campaign (e.g., gold mining in Canada). Almost all pump-and-dump campaigns are centered around penny stocks with a fairly low market capitalization (Table B1). For example, the median market capitalization for companies involved in these campaigns is just above €11 million.

3.2. Investor Sample and Individual Investor Trading Data

We obtain individual investor trading and portfolio data from a large German online bank that operates in all 16 states of the country. Out of the bank's more than half-million clients, we obtain a random sample of 113,000 investors. Thus, by construction, our sample should be quite representative for German investors with online brokerage accounts. We conduct several analyses to support this assumption. First, we gauge how our sample investors compare to the population of German stock market participants. In particular, we want to make sure that the investment portfolios are not online "play money" accounts. Towards this end, we compare the average portfolio value in our sample to the value reported in German national statistics. The Deutsche Bundesbank reports that the average portfolio value for German equity investors in 2013 is €48,000, which is slightly lower than our sample average of €55,854 at the end of 2013. We also compute and then compare the ratios of portfolio holdings to annual household income. As

investors in our dataset provide income in ranges (e.g., €100,000 - €150,000), we use the midpoint of each range to construct a measure for the average investor's income. We find that the ratio of the average portfolio value to average annual income is 1.3 in our sample, which is comparable to the ratio of 1.1 computed for German investors more broadly (German Federal Bureau of Statistics 2008b, 2008a; Deutsche Bundesbank 2013). Together, this evidence suggests that our sample of accounts is comparable to the population of German accounts. Second, we compare several key descriptive statistics for our sample to those reported in other household finance studies using U.S online brokerage data (e.g., Odean 1998; Barber and Odean 2001) and Scandinavian data (e.g., Calvet et al. 2007). Again, we find that the statistics for our sample are quite comparable (see Figure B2 in the Internet Appendix for details).

For each investor, we obtain a complete record of all trading activities from 2002 to 2015. This includes information on the transaction volumes, prices, and dates. We receive information on age, gender, residence (zip-code), marital status, education level, employment type, and for how long they have had an account with the bank. We also have self-reported categorical information on income levels, total wealth, and investment risk tolerance. Not all investors provide this information or personal characteristics, such as education and employment.

During our sample period, the investors in our sample made 29 million trades with an aggregate transaction value of €178 billion. Slightly more than half (55%) of the average investor's portfolio is invested in equities. The mean and median number of transactions (equity and non-equity trades) per year are 36 and 16, respectively, indicating that most investors manage their portfolios quite actively.[21] The majority of our sample is male (83%) with an average age of 51.

[21] This trade frequency is consistent with summary statistics reported in Barber and Odean (2002) for U.S. online accounts and in Dorn and Huberman (2002) using using German online brokerage data. The mean and median number of trades is higher than what is reported in FINRA investor surveys. However, these surveys are broader and not focused on online brokerage accounts with self-directed trading by investors, such as ours. Conversely, our

Prior research suggests that individuals with investment portfolios are more highly educated and financially savvy than the population (van Rooij et al. 2011; Cole et al. 2014). Consistent with this work, we find that 7% of the sample investors hold doctoral degree as compared to 1.5% of the German population (German Federal Bureau of Statistics 2015).

4. Participation and Performance

4.1. Investor Participation in Pump-and-Dump Schemes

Naturally, observing whether investors have obtained or seen the communication used to tout a stock (e.g., the promotional email, the boiler room call or the web forum) is impossible. We therefore code investors who purchase a stock within 60 days of the beginning of the pump phase as participating in the pump-and-dump scheme. We then provide several analyses in Section 4.2 showing this coding captures a response to the scheme, rather than coincidental participation.

In Table 1, we describe the characteristics of touts with a positive investor response. Out of the 470 distinct touts in our sample, 82% (385 touts) are traded by at least one investor in our bank sample during the 60-day period from the start of the tout.[22] Of the touts with a positive investor response, the average tout has approximately 78 purchase trades by our sample investors. However, we find that the distribution is positively skewed; the median tout has 18 purchases. Our sample investors make a total of 29,992 purchases in touted stocks during the assumed 60-day pump period. As some investors make multiple trades in the same touted stock during the pump campaign, we have a total of 18,680 tout-investor observations. Thus, the average tout investor makes approximately 1.6 purchases if they participate.

customer base is substantially less active but have much larger accounts than traders on app-based brokers such as eToro (Even-Tov et al. 2022) or Robinhood (e.g., Barber et al. 2022).

[22] As expected given the sample construction (Section 3.1), the participation in the BaFin subsample is slightly higher (84% of these touts have at least one sample investor participating) than in the hand-collected subsample (79%).

Panel B of Table 1 indicates that the average tout attracts 49 different investors from our sample and bank. However, there is considerable variation and skew with the median tout having 13 investors and the standard deviation being 105 investors. In total, we have 8,584 unique investors who participate in at least one tout in our sample. Thus, 7.6% (= 8,584/113,000) of all sample investors trade in at least one tout during our sample period.[23] We find that more than 50% of the investors participate only once but the average tout investor purchases nearly 2.2 distinct tout stocks, implying that at least some investors participate in multiple touts.

In Panel C of Table 1, we explore the characteristics of different tout campaigns. In Column (1), we use a linear probability model and find that tout firms that are headquartered in Germany are 9.5% more likely to have a positive investor response.[24] We also find that e-mail touts are more likely to garner a response than telephone-based campaigns, likely reflecting the greater reach by low cost e-mail campaigns. We do not find any differences in trading propensity between trading venue locations, potentially reflecting the ease with which investors can trade globally.

We also examine which attributes are associated with more "effective" campaigns in that they draw in more investors. In Column (2), we find that firms headquartered in Germany attract more investors, likely reflecting a form of home bias (French and Poterba 1991). Specifically, tout stocks headquartered in Germany have on average 44% more investors. E-mail and newsletter campaigns can reach a greater number of individuals at a relatively low cost and indeed we find that more investors participate when such media are utilized. We also find that touts investigated by BaFin

[23] Relative to the perhaps more appropriate denominator of investors with at least one equity transaction during our sample period (88,790), the participation rate increases to almost 10%. In Section 4.2, we estimante that at least 75% of the investors buying in the 60-day period directly respond to the tout promotion, which brings us again to a participation rate of 7.5%.

[24] In this tout-level analysis, we cluster standard errors by month of the tout. For all investor-level analyses, we cluster standard errors by investor and month. As double-clustered standard errors can have problematic properties that lead to downward bias in standard errors (e.g., Conley et al. 2018), we verify that, in our analyses, they generally lead to more conservative t-statistics compared to standard errors clustered by investor only.

are 14% more likely to be traded within our sample (extensive margin), but that such touts do not attract significantly more investors (intensive margin). The former finding likely reflects our sample construction, i.e., the fact that we know for the BaFin sample that the scheme targeted German investors, and the latter finding provides some comfort that, conditional on participation, the touts in the two subsamples are not substantially different. In Column (3), we find that schemes involving larger firms (as measured by pre-pump market capitalization) attract more investors. In Column (4), we explore the associations for the tout message and hence focus on the subset of touts for which we were to obtain the original tout message. We code a discrete variable ranging from 0 to 3 with higher values indicating a more sophisticated tout message (i.e., how professional the text is, whether it makes reference to specific financial data, etc.). We find that sophistication of the tout message is positively associated with more participation. This association is reassuring and a first indication that investors indeed respond to the tout itself, as otherwise it would be not be clear why the "quality" of the tout message should be associated with the investor response.

Our first important result is that the participation rate in touts is fairly high, with nearly 8% of all investors in our brokerage sample investing in at least one. Thus, our analysis shows that pump-and-dump campaigns engage a considerable number of retail investors.

4.2. Tout Response versus Coincidental Investment

In this section, we validate the assumption that investor purchases during the 60 days after the start of the tout campaign predominantly constitute "participation" in the pump-and-dump scheme. We provide two pieces of evidence indicating that investors indeed respond to the promotion rather than trade in touted stocks by coincidence.

First, we document a discontinuous change in the investment behavior for touted stocks after the beginning of the promotion period. Using a data-driven regression discontinuity approach

following Calonico et al. (2015), Panel A of Figure 3 shows a significant jump in the number of investors and the total investments in the touted stock right after the beginning of the promotion. This panel suggests a causal impact of the promotion and also an elevated investment for the next 50-60 days, which supports our coding. Moreover, the large jump in investment relative to the pre-pump period indicates that the vast majority of purchases are an explicit response to the scheme rather than normal trading.[25] The magnitude of the jump around day zero suggests that at least 75% of all tout investors are directly reacting upon the fraudulent promotion. Importantly, as Panel B shows, there is no such discontinuity in the price path. Thus, the increase in investor participation with the start of the promotion is not a response to investors "seeing" a price jump.

Second, we address the related concern that some investors respond to the (artificial) momentum in stock prices, which often starts even before the tout campaign, rather than the promotion itself. Towards this end, we match touted and non-touted stocks based on their price path and then examine the trading response by our sample investors after the promotion starts. Specifically, we first match on the initial share price levels of touted stocks before the pump-and-dump campaign using non-touted stocks from the same country and same time period using coarsened-exact matching. We use initial prices to ensure that control stocks have similar low-price, lottery characteristics as the touted stocks. In the next step, we match on returns to ensure that touted and control stocks have a similar run-up in prices just before the beginning of the campaign (see Internet Appendix for details on the matching procedure). This technique essentially matches stocks based on their price path until the beginning of the tout and ensures that control stocks exhibit similar return momentum.

Panel A of Figure 4 shows the price path of the touted and the matched non-touted stocks

[25] The total Euro investment in touted stocks by our sample investors is 345% higher in the 60-day pump period relative to the 60 days *preceding* the start of the tout campaign.

using raw and logged prices. Visually, the run-up in prices is relatively similar across both tout and control stocks until the beginning of the pump-and-dump campaign. We confirm with t-tests that the returns of the two groups are not significantly different shortly before the tout date.[26] Next, we examine investor responses to tout and matched control stocks. In Panel B, we measure investor responses in four different ways and compare treated and control stocks in event time: Total number of distinct stocks traded, average number of (new) investors per stock, average number of purchases per stock and average Euro investments per stock. All four figures provide evidence that investors *react* right when the tout campaign starts, and that this reaction fizzles around 50 to 70 days later. Trading patterns for touted and matched non-touted stocks are vastly different, implying that almost the entire response is attributable to the promotion, rather than prior return momentum.

The evidence from both tests validates our approach. The results strongly suggest that the vast majority of purchases within 60 days from the start of the tout campaigns are indeed investor responses to the schemes and in that sense constitute participation.[27]

4.3. Performance in Pump-and-Dump Schemes

In this section, we examine the portfolio and wealth consequences of investors' decisions to participate in pump-and-dump schemes. In Table 2, we provide descriptive statistics on the returns of investing in pump-and-dump campaigns. In Panel A, we describe the performance of individual tout trades. Within our sample, 85.1% of the tout trades are closed out during the sample period, i.e., roundtrip investments. For those trades that are not closed by the investor, we "close" the trade

[26] In the Internet Appendix, we provide results for a slightly more demanding matching procedure that also matches on stock returns in the 25 days period after the beginning of the tout campaign. This procedure increases the similarity of the return patterns for touted and control stocks (see Panel B of Table C1), but yields fewer matches. Figure C1 displays the corresponding price paths and investor responses. Our inferences remain unchanged. Our results are also robust to matching on the average pre-event trading volume (see Panel C of Table C1 or Figure C2).

[27] Table D1 in the Internet Appendix shows the key participation and performance statistics for four alternative pump-period windows. Unsurprisingly, absolute tout participation depends to some extent on window length, but other statistics are very stable indicating that our results do not depend on a specific window choice.

120 days after the purchase for the purpose of computing roundtrip returns.[28]

The mean raw return for the 29,922 tout purchases that occurred during the 60-day pump period is -25%.[29] This return partially reflects tout stocks' bid-ask spreads because we compute roundtrip returns using actual transaction prices. Considering that bid-ask spreads are an important trading cost (Barber and Odean 2000), especially in penny stocks (e.g., Brüggemann et al. 2018), we gauge to what extent negative returns are driven by spreads. For this analysis, we obtain end-of-day bid and ask prices from Datastream on the first date of the tout campaign. We then calculate roundtrip returns over various holding periods using either ask prices only or ask and bid prices. The former explicitly ignores the spread, wheras the latter incorporates it. Naturally, returns using ask prices only are less negative than the actual returns, but the average and the median tout returns are still very negative using holding peridods of 60, 90 or 120 days. For these holding periods, the spread accounts for roughly 30% (close to 20%) of the negative return for the average (median) tout. Interestingly, bid-ask spreads play an even larger role for returns during non-tout periods, consistent with the idea that tout campaigns create short-term liquidity.

We also compute the average market return over the period during which investors hold the touted stocks using the CDAX index (3%). Thus, the market-adjusted tout return is -28%. On

[28] Trades that investors do not close out over our sample period (i.e., inventory investments) tend to have more negative returns than roundtrip investments. With our 120-day assumption, the average return for inventory investments is -56%, compared to -19% for the average roundtrip investment. This difference makes sense for several reasons. Retail investors tend to hold losing investments for longer periods (Shefrin and Statman 1985; Odean 1998). Additionally, selling crashed stocks is often not feasible (no liquidity) or sensible (given fees). Thus, the return using a 120-day cut-off is likely to understate the magnitude of the losses associated with inventory investments. For example, roundtrip investments that are sold after this cut-off date have a more negative return (-63%) with only a quarter of those investments achieving better-than-average returns (i.e., above -56%).

[29] In this calculation, we set the maximum return for trades that investors do not close out over our sample period to 500%, which is akin to winsorizing holding returns. This adjustment reduces the impact of a few large return outliers (43 in total) that are likely caused by errors in the underlying Datastream data (e.g., stock splits that were not accounted for). It is likely that the actual returns of these investments were substantially lower or even negative. The maximum *realized* return for any roundtrip trade across all tout investors is 429%. Thus, if these 43 investments had been even more successful, it is implausible that investor would not have closed out.

average, each tout trade reduces investor wealth by €770.[30] Despite the significantly negative return for the average tout trade, we find that for a considerable fraction of the tout trades (28.6%) the return is actually positive. The average and median return for these trades are 27.2% and 12.22%, respectively. It is conceivable that some investors are attracted to touts because of these returns or the "lottery-like" payoffs suggested by the price path.

In Panel B of Table 2, we show the performance of tout investments by aggregating all trades by the same investor within a tout. We find the market-adjusted, value-weighted performance is -32%, indicating that relatively large tout trades tend to perform worse. The average loss per tout investment is €1,234. Aggregating these losses for all sample investors (approximately 49 investors per tout) yields a total loss of €59,857 per tout in our bank sample. This number is small but reflects that our investor sample represents only about 4% of all online brokerage accounts in Germany. Thus, assuming investors at other German online banks behave similarly, the average tout generates aggregate losses for German retail investors with online accounts of at least €1.45 million.[31] This estimate does not account for trading activity of investors with non-online brokerage accounts. These investors may be less responsive, but traditional brick-and-mortar accounts have a 90% market share in Germany. In addition, we are missing losses by investors in other countries that respond to the same touts.

To put the size of these losses in comparison, the median fraud that is criminally prosecuted in the United States generates losses of approximately $70,000, which is less than half of the

[30] White (2016) examines returns for trading in U.S. OTC stocks for a SEC White Paper and finds a considerably smaller loss per trade (median loss equals $96). For promoted stocks, he reports a mean holding return of -13%, which is better than the average return for our roundtrip investments (-18%).

[31] This estimate based on the market share of our bank sample (in terms of the number of accounts) is conservative. We can also compute aggregate losses based on trading volume. We relate the aggregate trading volume of German touts (for which we have the consolidated trading volume via Datastream) to the purchase trading volume in our sample over the 60-day pump period. Using this approach, we estimate that the aggregate losses to German investors are at least €1.7 to 2.3 million per tout.

median we obtain for the aggregate losses per tout. When converted to U.S. dollars, our estimate for the average aggregate losses of German investors per tout is more than the 90th percentile of the damages caused by prosecuted financial frauds in the United States ($1.75 million).[32] This comparison illustrates that pump-and-dump schemes are not small financial crimes and that the losses to individual investors are fairly substantial. We come to the same conclusion when we compare the above estimate for the average aggregate losses to the average misconduct-related damages by financial advisors ($551,471) as reported by Egan et al. (2018).[33]

In Panels C and D of Table 2, we examine the returns for the tout and non-tout part of the portfolios of investors who invest in at least one tout campaign. The performance of the tout part of the portfolios is aggregated by investor and described in Panel C of Table 2. The average tout investment by our sample investors is €14,035, but the standard deviation is €61,640 reflecting considerable variation in the invested amount across investors. The average value-weighted return for the tout portion of an investor's portfolio is -31% with the median value being similar in magnitude. Remarkably, the average return for the tout portion of the bottom quartile of tout investors is -63%. Our return evidence illustrates the importance of investor- and trade-level data because these losses are about an order of magnitude larger than estimates by prior papers using stock-level data (e.g., Frieder and Zittrain 2008).

Similarly, stock-level data require estimates of holding period to compute losses and the typical price path of a pump-and-dump scheme suggests relatively long holding periods. For instance, a hypothetical 120-day holding period yields a buy-and-hold return for the median tout of -68.4%, which is more negative than the average and median return, suggesting that many tout

[32] These statistics for damages of prosecuted frauds are calculated from 2002-2015 using data from the U.S. Sentencing Commission. They include all prosecuted offenses with an individual offense type of fraud.

[33] Still, we recognize that these losses are small when compared to total investor losses following an accounting fraud at a large capitalization stock, illustrating that loss magnitudes are closely tied to market capitalization.

investors limit losses by selling earlier. Our trade-level data allows us to explicitly compute holding periods and we find that 73.4% of the trades are closed out within 120 days from the start of the tout. The average (median) holding period is 71 (14) days.

Panel D of Table 2 shows the attributes of the non-tout part of the tout investors' portfolios and hence give us a sense for their overall investment behavior and portfolio performance. 6,834 of our 8,584 unique tout investors purchase other non-tout stocks during the 60-day pump period in which they purchase a touted stock. For these stock investments, the median and average value weighted return is -3% and -4%, respectively. This return is below the market return but considerably greater than the return in tout investments. The former observation is consistent with prior research showing the tendency for individual investors to underperform market indices (e.g., Barber and Odean 2000). The latter observation indicates that tout investments are indeed different and considerably worse than other investments made by tout investors.

5. Analysis of Investments in and after Pump-and-Dump Schemes

In this section, we investigate which individuals invest into touts and their investment behavior subsequent to these investments. We first explore investor characteristics that relate to tout participation and cross-sectional differences in investor returns. Next, we provide evidence on the existence of investor types, the impact of supervisory intervention on participation and how the pump-and-dump experience relates to subsequent tout and non-tout investments.

5.1. Characteristics of Tout Investors

Given the very negative returns to the average tout investment shown in Section 4, we seek to understand better who participates in pump-and-dump schemes and why. To provide a basis of comparison, we create a matched control sample of active equity investors. For each tout within a

given month, we draw a random sample of 2,000 investors that did not invest in any tout before this date. This step gives us a baseline sample of about 940,000 (= 470 x 2,000) control investor observations. We then retain only those investors who purchase at least one non-tout stock during the 60-day pump period. This restriction ensures that our control investors are fairly active and also invest in equities during the same time period. After applying this filter, our control sample comprises 159,446 observations from 52,171 control investors, as the same investor could be randomly drawn at different dates.

Using this matched sample, we investigate various characteristics associated with being a tout investor more closely. We provide descriptive comparions between tout and control investors in the Internet Appendix (Table B3). Table 3 reports the results from OLS regressions. We find that investors who are male, older, and have a higher investment risk tolerance are more likely to be tout investors (Table 3, Column 1).[34] Additionally, investors with a greater wealth (based on the value of their entire portfolio including cash liquidity) are less likely to invest in touts. In Column (2), we add portfolio-level characteristics. Investors who hold riskier portfolios are more inclined to invest into touts. Specifically, those with a higher share of penny stocks, a lower proportion of blue chip shares, and a greater number of individual stocks are more likely to become tout investors.

Importantly, personal characteristics alone have limited ability to explain the propensity to become a tout investor (R^2=2.0%). However, adding portfolio-level characteristics significantly enhances the explanatory power of the model (R^2=8.7%). This finding suggests that tout investors can be better identified based on their "actions," i.e., portfolio composition and investment

[34] An investor's risk tolerance is an investor's self-reported assessment of their desire for risk and range from 1 to 5. Clients of our sample German bank are only allowed to purchase securities equal or below their self-reported risk class. For example, to be able to trade in blue chips stocks, clients need to select at least risk-class 3 and to trade in penny stocks a risk-class of 5 is required.

behavior, than based on their personal characteristics.[35] In Column (3), we add variables that proxy for investors' behavioral characteristics and biases (e.g., Barber and Odean 2000; Dorn and Huberman 2010) to examine how they relate to tout investments. Tout investors have a substantially higher trading frequency, considerably lower and more volatile portfolio returns despite having a somewhat less concentrated stock portfolio. Taken together, these characteristics suggest that these investors are likely to be overconfident and perhaps overestimate their stock picking and market timing abilities (Barber and Odean 2000). The inclusion of these behavioral variables also significantly increases the explanatory power of the model (adjusted R^2 increases to 12.7%).

In Column (4), we add geographic district-level variables to the regression. We find that investors living outside of cities, in East Germany and in districts with relatively lower education levels (measured as the percentage of the population having a college education) have a higher propensity to invest in touted stocks.[36] However, local economic conditions (measured as the district-level unemployment) do not predict tout participation and, jointly, these district-level variables do not add much explanatory power (the adjusted R^2 even decreases slightly). Finally, in Column (5), we add the investor's profession to the model. Investors self-report their profession when they open the brokerage account with the bank. It captures broad employment categorizations (the omitted category is "dependents and others," which includes students, apprentices and unemployed people). Again, the explanatory power increases only modestly after the professional indicators are added to the model (R^2=12.7%). Relative to the omitted category

[35] This conclusion is subject to one caveat. For about 524 of our 8,584 tout investors (~ 6%), we do not have all the main personal characteristics (gender, age, etc.). Additionally, another 629 tout investors (~ 7%) choose not to disclose their profession to the bank.

[36] The positive coefficient for East Germany is in line with Laudenbach et al. (2020). They find that investors from East Germany make inferior stock market investments compared to investors from West Germany. They interpret this finding as a negative long-term effect of communism in East Germany.

(3% of all tout investors and 4% of all control investors), we find that blue-collar workers, retirees, and self-employed are more likely to be tout investors. This result (together with the district-level variable) suggests that education could play a role in tout participation. However, our model cannot separate whether certain investors are more responsive to pump-and-dump schemes or promoters target people with certain personal characteristics.

Remarkably, over one-third of the tout investors included in the analyses of Table 3 make more than one tout investment over the sample period. This large fraction of "repeat investors" is noteworthy given the large negative return of the average tout investment. One explanation could be that multi-tout and single investors fare quite differently, suggesting that they are different investor types. Put differently, multi-tout investors could possess superior trading skills or participate in touts for different reasons. To shed light on this question, Table 4 provides descriptive statistics conditional on the number of tout investments. Surprisingly, multi-tout investors seem to be a more 'extreme' version of the average single-tout investors, rather than a different type. For example, the share of penny (blue chip) stocks increases (decreases) in the number of tout investments. Investors with only one tout investment have a 23% penny stock share, whereas this percentage reaches over 40% for investors with seven or more touts. We find little support for the notion that, in general, multi-tout investors are superior traders or more successful in their tout investments. Although their mean return is higher than the mean return of single-tout investors, it is still quite negative (e.g., -23% for investors with seven or more touts). Moreover, multi-tout investors incur large cumulative losses. For instance, an investor with five tout investments loses nearly €5,700 across all touts, compared to €1,250 by a single-tout investor.

In Table 5, we turn explicitly to the question of what explains "success" or better performance

of tout investments.[37] In Column (1), we relate investors' average tout returns to personal and portfolio-level characteristics. Although most characteristics do not exhibit significant associations with returns, tout investors that hold a larger fraction of penny stocks and fewer stocks in their portfolio tend to have more positive tout returns. In Column (2), we compare multi-tout investors (those who invest in four or more) with other tout investors. On average, these multi-tout investors have a return that is 6.9 percentage points higher. In Column (3), we add investor- and tout-fixed effects and focus the relative timing of the purchase and past tout experience (counting the number of touts participated). By adding these fixed effects, we conduct all analyses *within* tout investor and relative to all other tout investors that invested in the *same* tout. First, we find that investors who invest relatively early into the tout (compared to other investors that invest into the same tout) have more positive returns. This result highlights the pyramid-scheme nature of pump-and-dump campaigns. The coefficient estimate implies that investors who purchase after the beginning of the tout (and hence are not likely the perpetrators or affiliated with the promoters) can still profit from a pump-and-dump scheme if they invest early and quickly flip the tout to other investors.[38] Second, we find a negative coefficient for the variable counting the number of touts that an investor has participated in including the most recent one. This result suggests that repeated participation does not increase performance and, hence, the positive coefficient for multi-tout investors in Column (2) is not due to learning.

5.2. Types of Tout Investors

As discussed in Section 2.2, investors may participate in pump-and-dump campaigns for

[37] We also explore whether certain tout-stock characteristics (e.g., location of headquarter) are related to investor-level returns. However, this analysis yields largely inconclusive results.

[38] Our descriptive statistics in Table 2, Panel B, suggest that fewer than 25% of the investors are able to do so. We check and do not find evidence using returns or trading data suggesting that some of our sample investors are perpetrators or affiliated with the promoters.

different reasons, consistent with the notion that there are different tout investor types. While some investors likely are duped by the promoters and their campaigns, other investors may be aware of the nature of the pump-and-dump scheme and choose to invest with the goal of quickly flipping the stock for a profit. However, the *ex-ante* motives of tout investors are rarely, if ever, expressed and hence not observable to us. To address this challenge, we infer investor types by classifying individuals based on their past trading behavior in *non-touted* stocks.

We create four investor categories: *New Trader*, *Conservative Traders*, *Day Traders*, and *Short-term Traders* (plus a fifth intermediate category that captures all remaining traders who do not fall into any of other categories). We create a separate investor type, *New Traders*, for those who recently opened an account at the bank, because it is difficult to characterize past non-tout investment behavior for these people. The second investor group, *Conservative Trader*, comprises people who traded fewer than three times in the six months before the tout date. This investor category contains the least active equity investors who have relatively little experience with stock investments (and presumably little exposure to penny stocks). Given their limited trading experience, investors in this group are potentially more vulnerable to pump-and-dump schemes. The next two investor groups contain traders that frequently trade in stocks and typically have short holding periods. They seem to engage in individual stock picking, but also have more experience in the equity market. We classify investors with at least three day trades over the last six months as *Day Traders*, and investors who flipped at least three stocks within a week as *Short-term Traders.*[39] We define these investor types as mutually exclusive.

In Table 6, Panel A, we show the sample composition by investor types, separately for tout

[39] Focusing on explicitly penny stock investments would further improve the discriminatory power of the investor group classification (e.g., focusing on investors that frequently purchase penny stocks or quickly flip penny stocks compared to other investments). However, since most tout investments are related to penny stocks, we want to avoid a mechanical relation between the investor group definitions and tout investments.

and active control investors. There are relatively few *New Traders* and, if anything, tout investors are less likely to be *New Traders* (7.6% versus 11.3%), suggesting that it is not common for individuals to open an account simply to make a tout investment.[40] In our sample, most tout participants already had an account for some time and thus some familiarity with stock investments. For the other groups, there are striking differences in the frequencies. While only 0.9% of control investors are *Day Traders*, 5.2% of all tout investors are of this type. *Conservative Traders*, in contrast, are underrepresented in the tout investor sample (29.2% versus 55.6% in the control sample). As *Day Traders* and *Short-term Traders* are more likely to understand the risks of investing in penny stocks, their participation is less likely to be due to deception. These investors comprise 19.6% of the tout sample and are responsible 29.7% of all tout investments. These numbers suggests that a substantial portion of tout investors would be less aptly described as being deceived when making tout investments, which one of the key insights from our study. *Day Traders* in the tout sample also tend to be younger (42 years) and less likely to be married (51%) than the other types in the tout sample (46 years and 61%) or *Day Traders* in the control sample (45 years and 58%). These investors appear to be quite similar to the risk-seeking traders that were fueling the recent surge in trading in speculative "meme stocks" (e.g., Moise and Singh 2021).

Next, we re-estimate our models in Tables 3 and 5, adding indicators for the different investor types, to confirm that the types have explanatory power beyond the previously used characteristics. In Table 6, Panel B, Column (1), we investigate the association between investor types and tout participation. In line with the frequencies in Panel A, we find that *Conservative Traders* have a significantly lower likelihood of participating in pump-and-dump campaigns, whereas *Day Traders* and *Short-term Traders* participate with significantly higher frequencies compared to the

[40] We cannot investigate with our data whether this result reflects a deliberate strategy by promoters (i.e., they have lists of people with investment accounts) or selection (i.e., people without accounts tend not to be responsive to tout communications).

intermediate type (omitted category). We note that the adjusted R^2 of the regression increases considerably (from about 8.7% to 11.8%) once we add the investor-type indicators. This increase in explanatory power is statistically significant (the F-Test has a p-value <0.01) and suggests that our investor type classification captures meaningful differences in the propensity of tout participation, despite the fact that the classification is based on past investment behavior in *non-touted* stocks. Column (2) shows the results for the return regression. Both *Day Traders* and *Short-term Traders* have significantly larger returns as compared with the residual category. The return difference is 21.6% for *Day Traders* and 13.1% for *Short-term Traders*. These findings are in line with the notion that *Day Traders* and *Short-term Traders* are unlikely to be deceived by the pump-and-dump schemes. Although the return differences are large, the average tout investment return is still negative for both groups.

We conduct additional analyses exploiting our investor type classification. Specifically, in Column (3), we assess whether certain investor types are more likely to sell off the tout early in the promotional period. Indeed, frequent traders (and particularly *Day Traders*) sell their tout stocks more quickly, but still end up with negative average returns. In contrast, *Conservative Traders* seem to be very reluctant to sell the touted stock for a loss, which is consistent with the well-known disposition effect. Finally, in Column (4), we run a linear probability model to test whether certain investor types differ in how much they invest in a tout ('tout stake'). It is conceivable that some invest only small amounts to 'dip their toe into the water.' In contrast, more seasoned traders may make more substantive investments once they decide to invest. To shed light on such strategies, we code the dependent variable as '1' if an investor invests less than 2.38% of her portfolio value into the tout (i.e., which is equal to the value of the lowest quintile). We find that, relative to the intermediate type, the two frequent trader types are less likely to invest small amounts in touted stocks. *Conservative Traders* are more likely to 'dip their toe' relative to the

two frequent trader types (but not significantly more likely relative to the residual category).

Overall, the analysis reported in Table 6 provides evidence that there are several distinct investor types who invest in pump-and-dump schemes. Specifically, we find a substantial number of investors who appear to trade in penny stocks and other non-tout stocks with high frequency. For these investors, tout participation is less likely due to deception, but instead is more deliberate and likely a form of gambling or speculation. This interpretation is further supported by the evidence on the differential tout performance of the investor types. Our evidence suggesting different motivations for tout participation is important because securities regulators likely need different strategies to protect different types of investors. This message is reinforced by recent reports that certain types of retail investors appear to gamble in meme stocks (e.g., Sartain 2021).

5.3. Investor Reactions to Supervisory Interventions and Warnings

After documenting the heterogeneity in investor participation, we examine whether this heterogeneity is relevant for effective investor protection. To do so, we exploit that the supervisory agency, BaFin, issued warnings of ongoing market manipulation for a subset of the pump-and-dump schemes in our sample. In these cases, BaFin publicly released warnings on their webpage about ongoing fraudulent promotions, which were then picked up by the business press and specialized trading websites.

In Table 7, we examine the trading behavior in touted stocks after the issuance of these warnings. Out of the 221 BaFin touts with active trading in our sample, we identify 21 cases for which BaFin issued public warnings in the first 60 days after the beginning of the tout. In Panel A, we report the effects of the public warning on investor trading after controlling for tout- and

event-time fixed effects.[41] In Column (1), we find that about 25% (= $e^{-0.290}$-1) fewer investors purchase a touted stock after BaFin issues a public warning. Although this average effect is large, it is not clear that all investors pull back. We explore the heterogeneity in the investor response by restricting the sample to regular investors in Column (2) and to frequent traders in Column (3). Comparing columns, we find that the effect is almost exclusively concentrated among 'regular' trader types. As shown in Column (3), the effect on frequent trader types is significantly smaller; these traders seem to hardly adjust their trading behavior at all.[42]

In Panel B, we zoom in on the 21 touted stocks with public BaFin warnings and perform a regression discontinuity design with local linear regressions around the warning date. This design exploits the discontinuous reaction of investors around the BaFin warning and therefore allows for a stronger causal interpretation of the effects of supervisory intervention. Using this design, we find larger effect sizes (up to 30%) after the BaFin warning on investor behavior for regular traders. Again, the effects for frequent traders are only marginally significant. Taken together, we find that public warnings are a supervisory strategy to discourage participation. However, the effectiveness of this strategy depends markedly on the underlying investor trading motives (or types).

5.4. Subsequent Investments and Market Participation after Pump-and-Dump Experience

For our final set of analyses, we turn to the question of how past tout experiences influence subsequent investments. We first investigate the willingness to invest in a subsequent pump-and-dump scheme conditional on prior tout performance, controlling for various portfolio characteristics and investor types. In Table 8, Column (1), we examine whether investors with a

[41] Regressions with "log-plus-1" transformed outcome variables may not yield consistent results (Cohn et al. 2022). We therefore confirm that we obtain similar results (esp. for Tables 7 and 9) using Poission regressions instead.

[42] Note that these results are not driven by the different sizes of the investor base (i.e., regular traders being a larger group of investors). We run the regressions separately for both groups and include tout fixed effects to control for the average number of regular or frequent traders within each tout.

more positive experience in their first tout are more likely to invest in a second tout. Consistent with this idea, we find that the tout return decile is positively associated with a future tout investment. The coefficient implies that a one-decile increase in the first tout's return makes it 5.7% (i.e., 2.0 percentage points) more likely that an investor participates in a second pump-and-dump campaign. In Column (2), we focus on the first four touts of an investor (if she invests in several) and include the return decile of the investor's most recent as well as the return decile of the prior tout (which drops the first tout observation of each investor). We find that only the most recent tout return is positively associated with a subsequent tout investment (F-Test $p < 0.01$). Other right-hand side variables have plausible and expected associations. For example, investors with higher penny stock shares and lower blue-chip shares are more likely to invest in another tout.

We also find in Columns (1) and (2) that the investor types have significant explanatory power for subsequent tout investments. *Day* and *Short-term Traders* have a significantly higher likelihood of investing in another touts. In fact, some of them might even be actively seeking out touts. In contrast, *Conservative Traders* are much less likely to invest into another tout, following the "once-bitten-twice-shy" rule, which is what we expect to see if investors were tricked.

In Column (3), we explore how past performance relates to the time until the next tout investment. We find that, for investors who invest in another campaign, those with a higher recent tout return invest more quickly into the next one. A one-decile increase in the most recent tout return reduces the time between two tout investments by approximately 10.2%. That is, more successful investors appear to be more eager to invest into another tout. In Column (4), we find that investors with higher returns in a prior tout stay longer in the next tout. Both findings are consistent with the idea that higher past tout performance leads to overconfidence.

In sum, investors' prior experiences with pump-and-dump schemes appear to influence their

future tout investments. Investors who have negative experiences, i.e., relatively poor returns, are less likely to participate again and, if they do, they increase wait times and shorten holding periods. In contrast, investors who are initially successful are more likely to continue participating accumulating larger losses than initially unsuccessful investors. These findings are in line with anecdotal accounts in the business press describing retail investors as "getting hooked" into risky investments after being initially successful in one of their gambles (e.g., Sartain 2021). As such, our evidence raises the possibility that pump-and-dump schemes have broader distortionary effects in markets beyond the immediate losses to investors.

Next, we extend the analysis and study the long-term effects on subsequent non-tout investments and market participation more broadly. We use a generalized difference-in-differences design to analyze long-term changes in the investment behavior of investors with a tout experience relative to otherwise-similar control investors without such an experience. Specifically, we construct a panel dataset of tout and control investors' portfolios in a 42-month window around the (matched) tout month. We then use this matched dataset to analyze how the participation in a pump-and-dump scheme shapes subsequent investment strategies and stock market participation. We focus on the first tout of regular traders as the event. These types are more likely to have fallen prey to a pump-and-dump scheme and in that sense are the most interesting group to study with respect to experience effects.[43] We use a relatively stringent set of fixed effects and include investor and event-time (interacted with the tout-month) fixed effects to control for time-invariant differences across investors as well as market trends and common changes to investor portfolios over time.[44] We add further fixed effects by interacting all personal and portfolio characteristics

[43] Another advantage of restricting the sample to regular traders is that we are able to ensure a more homogenous treatment and control group. For the other types, it is difficult to obtain parallel trends in the pre-period. Nevertheless, we find comparable effects when using the entire sample of tout investors.

[44] As explained in Section 5.1, we randomly draw 2,000 control investors for each tout within a given month and then retain only active control investors (i.e., require that they purchased at least one stock within 60 days of the tout).

with event-time and, where indicated, match treatment and control investors using entropy balancing for the same covariates. As part of this matching, we also explicitly control for portfolio returns around the tout date to ensure that the results are not simply driven by wealth effects from the tout participation. Table 9, Panel A, reports the main results. In Column (1), we focus on investors' stock market participation after the tout. We find that tout investors are 19% (or 1.8 percentage points) more likely to close their account or disinvest their portfolio following a pump-and-dump experience. In Column (2), we find that tout investors significantly reduce their investments in blue-chip stocks. In Column (3), we show that the result extends to more passive fund investments. Thus, rather than shifting away from certain risky investments or penny stocks, investors with a pump-and-dump experience seem to abandon the stock market altogether. In Columns (4) to (6), we confirm that these results continue to hold after matching treatment and control investors on demographic and portfolio characteristics.

In Panel B, we explore the parallel trends assumption by mapping out the interaction term for the tout experience over time. Across all specifications, we see that the effect of a pump-and-dump experience starts to materialize within six months after the tout.[45] More importantly, the effect is relatively persistent and even increases over time when analyzing stock market participation and mutual fund investments. Thus, the effects are not temporary, but long lasting, which also provides comfort that the observed changes in subsequent investment behavior are not merely driven by the direct impact of the tout on investor wealth.

Taken together, these results suggest that investors experiencing a pump-and-dump scheme are subsequently more likely to shy away from the stock market altogether. In that sense, pump-

By interacting the event-time fixed effects with the tout month, we ensure that tout investors are directly compared with control investors that were active in the stock market around the same time.

[45] Additionally, after applying the matching in Column (4) to (6), we do not observe any significant trends in the pre-period.

and-dump schemes seem to have broader ramifications (or externalities) even beyond their direct financial impact. This finding complements prior research showing that past experiences can shape investors' investment decisions. For example, Malmendier and Nagel (2011) show that investors' life-time experiences generally have a profound impact on their financial risk taking. More specifically related to fraud cases, Gurun et al. (2018) find that communities exposed to Bernie Madoff's Ponzi scheme subsequently withdrew assets from financial advisors and Giannetti and Wang (2016) show that investors located in states that were exposed to corporate accounting scandals decreases their stock market participation.

6. Conclusion

Although pump-and-dump schemes have long been the subject of significant regulatory attention, we have relatively little evidence on investor participation in such schemes as well as on what participation means for investors. Using a proprietary dataset of trading records for a large number of individual investors along with a database of pump-and-dump schemes, our paper sheds light on individual investor participation in and outcomes of market manipulation. Our evidence suggests that participation in pump-and-dump schemes is quite common and results in sizable losses for investors. Nearly 8% of the sample investors participate in at least one pump-and-dump scheme, losing on average nearly 30% of their investment. We document that this experience has broader ramifications beyond the direct loss from their tout investment. These investors are more likely to divest relatively safer stocks and funds or leave the stock market altogether.

There is considerable heterogeneity in participation and investment outcomes, with a considerable fraction of investors participating in multiple touts. We find that portfolio composition and past trading behavior are better able to explain participation in touted stocks than investor demographics. Moreover, we identify several distinct types of investors, some of which

should not be viewed as simply falling prey to these schemes. A sizeable fraction of the investors trades frequently, even daily in penny stocks. For these investors, speculation or gambling are more likely to be the motive for tout participation.

Our analysis offers several insights that could help with designing effective investor protection against pump-and-dump schemes. We show that supervisory warnings that flag ongoing market manipulation can reduce participation by some investors. This evidence is useful for securities regulators but also for trading platforms with warning signs on ticker symbols such as the U.S. OTC Markets (Brüggemann et al. 2017) because these investors are also likely to be more responsive to prompts when making the initial investment decision. For instance, brokerages could offer prompts to investors that ask them to assess the reasonableness of the claims in the tout communication or nudge them to take more time with the trading decision (Burke et al. 2022). However, such techniques are less likely to be effective for investors who gamble or even deliberately seek these schemes thinking they could profit from the run-up. As we show, such investors are less likely to be dissuaded from investing by supervisory warnings.

The documented heterogeneity in investor motives and types poses challenges to securities regulators aiming to curtail investments in pump-and-dump schemes. Doing so could still be worthwhile even when a sizeable fraction of investors is not tricked because any investor participation fuels the run-up in prices and provides greater benefits to promoters, which in turn encourages the creation of pump-and-dump schemes in the first place. Thus, investor participation in market manipulation creates negative externalities in the market overall.

References

Aggarwal, R.K., and G.J. Wu. 2006. Stock Market Manipulations. *Journal of Business* 79 (4): 1915-1953.

Allen, F., and D. Gale. 1992. Stock-Price Manipulation. *The Review of Financial Studies* 5 (3): 503-529.

Antilla, S. 2016. Retirement Fallout from a Penny-Stock Scam: 'We Don't Do Hardly Anything'. *The Street*, published on April 24, 2016 [retrieved April 1, 2017]. Available from https://www.thestreet.com/story/13527493/1/retirement-fallout-from-a-penny-stock-scam-we-don-t-do-hardly-anything.html.

Antweiler, W., and M.Z. Frank. 2004. Is All That Talk Just Noise? The Information Content of Internet Stock Message Boards. *The Journal of Finance* 59 (3): 1259-1294.

Barber, B.M., X. Huang, T. Odean, and C. Schwarz. 2022. Attention-Induced Trading and Returns: Evidence from Robinhood Users. *The Journal of Finance* 77 (6): 3141-3190.

Barber, B.M., and T. Odean. 2000. Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors. *The Journal of Finance* 55 (2): 773-806.

———. 2001. Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment. *The Quarterly Journal of Economics* 116 (1): 261-292.

———. 2008. All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors. *The Review of Financial Studies* 21 (2): 785-818.

———. 2013. The Behavior of Individual Investors. *Handbook of the Economics of Finance* 2: 1533-1570.

Bazerman, M.H., and A.E. Tenbrunsel. 2011. Blind Spots: Why We Fail to Do What's Right and What to Do About It: *Princeton University Press*.

Böhme, R., and T. Holz. 2006. The Effect of Stock Spam on Financial Markets. *Working Paper*.

Brüggemann, U., A. Kaul, C. Leuz, and I.M. Werner. 2018. The Twilight Zone: Otc Regulatory Regimes and Market Quality. *Review of Financial Studies* 31 (3).

Burke, J., C. Kieffer, G. Mottola, and F. Perez-Arce. 2022. Can Educational Interventions Reduce Susceptibility to Financial Fraud? *Journal of Economic Behavior & Organization* 198: 250-266.

Calonico, S., M.D. Cattaneo, and R. Titiunik. 2015. Optimal Data-Driven Regression Discontinuity Plots. *Journal of the American Statistical Association* 110 (512): 1753-1769.

Calvet, Laurent E., John Y. Campbell, and P. Sodini. 2007. Down or Out: Assessing the Welfare Costs of Household Investment Mistakes. *Journal of Political Economy* 115 (5): 707-747.

Chen, Y., A. Kumar, and C. Zhang. 2021. Searching for Gambles: Gambling Sentiment and Stock Market Outcomes. *Journal of Financial and Quantitative Analysis* 56 (6): 2010-2038.

Chugh, D., and M.H. Bazerman. 2007. Bounded Awareness: What You Fail to See Can Hurt You. *Mind & Society* 6 (1): 1-18.

Cohn, J.B., Z. Liu, and M.I. Wardlaw. 2022. Count (and Count-Like) Data in Finance. *Journal of Financial Economics* 146 (2): 529-551.

Cole, S., A. Paulson, and G.K. Shastry. 2014. Smart Money? The Effect of Education on Financial Outcomes. *The Review of Financial Studies* 27 (7): 2022-2051.

Conley, T., S. Gonçalves, and C. Hansen. 2018. Inference with Dependent Data in Accounting and Finance Applications. *Journal of Accounting Research* 56 (4): 1139-1203.

Deason, S., S. Rajgopal, and G.B. Waymire. 2015. Who Gets Swindled in Ponzi Schemes? *Working Paper, Emory University*.

DeCambre, M. 2021. Gamestop's Surge Is Making It One of the Most Traded Stocks in the U.S. . *MarketWatch*, published on January 27, 2021 [retrieved May 31, 2021]. Available from https://www.marketwatch.com/story/gamestops-stock-surge-is-making-it-one-of-the-most-traded-in-the-u-s-11611767301.

Deutsche Bundesbank. 2013. Statistik Über Wertpapierinvestments [Statistic About Stock Investments].

Dhawan, A., and T.J. Putniņš. 2022. A New Wolf in Town? Pump-and-Dump Manipulation in Cryptocurrency Markets*. *Review of Finance* Forthcoming.

Dorn, A.J., D. Dorn, and P. Sengmueller. 2014. Trading as Gambling. *Management Science* 61 (10): 2376-2393.

Dorn, D., and G. Huberman. 2005. Talk and Action: What Individual Investors Say and What They Do. *Review of Finance* 9 (4): 437-481.
———. 2010. Preferred Risk Habitat of Individual Investors. *Journal of Financial Economics* 97 (1): 155-173.
Dorn, D., and P. Sengmueller. 2009. Trading as Entertainment? *Management Science* 55 (4): 591-603.
Eaton, G.W., T.C. Green, B.S. Roseman, and Y. Wu. 2022. Retail Trader Sophistication and Stock Market Quality: Evidence from Brokerage Outages. *Journal of Financial Economics* 146 (2): 502-528.
Egan, M., G. Matvos, and A. Seru. 2018. The Market for Financial Adviser Misconduct. *Journal of Political Economy* 127 (1): 233-295.
Eraker, B., and M. Ready. 2015. Do Investors Overpay for Stocks with Lottery-Like Payoffs? An Examination of the Returns of Otc Stocks. *Journal of Financial Economics* 115 (3): 486-504.
Even-Tov, O., K. George, S. Kogan, and E.S. So. 2022. Fee the People: Retail Investor Behavior and Trading Commission Fees. *Working Paper*.
Faux, Z., and D. Lawrence. 2014. Searching for Cynk: The $6 Billion Penny-Stock Debacle, from Belize to Las Vegas. *Bloomberg*.
Fecht, F., A. Hackethal, and Y. Karabulut. 2017. Is Proprietary Trading Detrimental to Retail Investors? *The Journal of Finance* 73 (3): 1323-1361.
Frankel, T. 2012. The Ponzi Scheme Puzzle: A History and Analysis of Con Artists and Victims: *Oxford University Press*.
French, K.R., and J.M. Poterba. 1991. Investor Diversification and International Equity Markets. *The American Economic Review* 81 (2): 222-226.
Frieder, L., and J. Zittrain. 2008. Spam Works: Evidence from Stock Touts and Corresponding Market Activity. *Hastings Communications and Entertainment Law Journal* 30: 479-520.
Gao, X., and T.C. Lin. 2014. Do Individual Investors Treat Trading as a Fun and Exciting Gambling Activity? Evidence from Repeated Natural Experiments. *Review of Financial Studies* 28 (7): 2128–2166.
German Federal Bureau of Statistics. 2008a. Einkommens- Und Verbrauchsstichprobe: Einkommen, Einnahmen & Ausgaben [Income and Consumption Sample Statistic: Earnings, Income & Expenditures].
———. 2008b. Einkommens- Und Verbrauchsstichprobe: Vermoegen & Schulden [Income and Consumption Sample Statistic: Assets & Liabillites].
———. 2015. Statistisches Jahrbuch [Statistical Yearbook].
Giannetti, M., and T.Y. Wang. 2016. Corporate Scandals and Household Stock Market Participation. *Journal of Finance* 71 (6): 2591-2636.
Gino, F. 2013. Sidetracked: Why Our Decisions Get Derailed, and How We Can Stick to the Plan: *Harvard Business Review Press*.
Griffin, S.P., and A.A. Block. 2001. Penny Wise: Accounting for Fraud in the Penny-Stock Industry. Contemporary Issues in Crime and Criminal Justice: Essays in Honor of Gilbert Geis: *Prentice Hall Publishing*.
Guiso, L., P. Sapienza, and L. Zingales. 2008. Trusting the Stock Market. *The Journal of Finance* 63 (6): 2557-2600.
Gurun, U.G., N. Stoffman, and S.E. Yonker. 2018. Trust Busting: The Effect of Fraud on Investor Behavior. *The Review of Financial Studies* 31 (4): 1341-1376.
Jiang, G.L., P.G. Mahoney, and J.P. Mei. 2005. Market Manipulation: A Comprehensive Study of Stock Pools. *Journal of Financial Economics* 77 (1): 147-170.
Karpoff, J.M., D.S. Lee, and G.S. Martin. 2008a. The Consequences to Managers for Financial Misrepresentation. *Journal of Financial Economics* 88 (2): 193-215.
———. 2008b. The Cost to Firms of Cooking the Books. *Journal of Financial and Quantitative Analysis* 43 (3): 581-611.
Karpoff, J.M., and J.R. Lott. 1993. The Reputational Penalty Firms Bear from Committing Criminal Fraud. *Journal of Law & Economics* 36 (2): 757-802.

Khwaja, A.I., and A. Mian. 2005. Unchecked Intermediaries: Price Manipulation in an Emerging Stock Market. *Journal of Financial Economics* 78 (1): 203-241.

Kumar, A. 2009. Who Gambles in the Stock Market? *The Journal of Finance* 64 (4): 1889-1933.

Kyle, A.S., and S. Viswanathan. 2008. How to Define Illegal Price Manipulation. *American Economic Review* 98 (2): 274-279.

Laudenbach, C., U. Malmendier, and A. Niessen-Ruenzi. 2020. The Long-Lasting Effects of Experiencing Communism on Attitudes Towards Financial Markets. *CEPR Discussion Paper*.

Lee, C.M. 1992. Earnings News and Small Traders: An Intraday Analysis. *Journal of Accounting and Economics* 15 (2): 265–302.

Lerer, L., and A.W. Herndon. 2021. When Ted Cruz and A.O.C. Agree: Yes, the Politics of Gamestop Are Confusing. *New York Times*, published on February 18, 2021 [retrieved May 31 2021]. Available from https://www.nytimes.com/2021/01/31/us/politics/gamestop-robinhood-democrats-republicans.html.

Leuz, C., and P.D. Wysocki. 2016. The Economics of Disclosure and Financial Reporting Regulation: Evidence and Suggestions for Future Research. *Journal of Accounting Research* 54 (2): 525-622.

Loos, B., S. Meyer, and M. Pagel. 2020. The Consumption Effects of the Disposition to Sell Winners and Hold Losers. *Working Paper*.

Malmendier, U., and S. Nagel. 2011. Depression Babies: Do Macroeconomic Experiences Affect Risk Taking? *The Quarterly Journal of Economics* 126 (1): 373-416.

———. 2016. Learning from Inflation Experiences. *The Quarterly Journal of Economics* 131 (1): 53-87.

Miles, S., and D. Pyne. 2017. The Economics of Scams. *Review of Law & Economics* 13 (1): 1-18.

Moise, I., and M. Singh. 2021. Young, Confident, Digitally Connected - Meet America's New Day Traders. *Reuters*, published on February 2, 2021 [retrieved May 31 2021]. Available from https://www.reuters.com/article/us-retail-trading-investors-age/young-confident-digitally-connected-meet-americas-new-day-traders-idUSKBN2A21GW.

Nelson, K.K., R.A. Price, and B.R. Rountree. 2013. Are Individual Investors Influenced by the Optimism and Credibility of Stock Spam Recommendations? *Journal of Business Finance & Accounting* 40 (9-10): 1155-1183.

Odean, T. 1998. Are Investors Reluctant to Realize Their Losses? *The Journal of Finance* 53 (5): 1775-1798.

———. 1999. Do Investors Trade Too Much? *American Economic Review* 89 (5): 1279-1298.

Phillips, M. 2021. Penny Stocks Are Booming, Which Is Good News for Swindlers. *New York Times*.

Putnins, T.J. 2012. Market Manipulation: A Survey. *Journal of Economic Surveys* 26 (5): 952-967.

Ramezani, C.A., and J.J. Ahern. 2022. Financial Market Outcomes and Gambling at the Racetracks. *Working Paper*.

Reimann, A., and H. Reimer. 2012. Neue Details Zur Großrazzia Wegen Kursmanipulation [New Details About Large-Scale Raid Linked to Market Manipulation]. *Wirtschaftswoche*, published on March 3, 2012 [retrieved April 1, 2017]. Available from http://www.wiwo.de/finanzen/boerse/aktien-skandal-neue-details-zur-grossrazzia-wegen-kursmanipulation-/6282368.html.

Renault, T. 2018. Market Manipulation and Suspicious Stock Recommendations on Social Media. *Working Paper*.

Sartain, K. 2021. I Got Addicted to Trading Stocks with Robinhood During the Gamestop Saga. I Know Amateur Traders Like Me Are Playing with Fire, but I Worry That It's Too Late to Break the Addiction. *Business Insider*.

Schmittmann, J.M., J. Pirschel, S. Meyer, and A. Hackethal. 2014. The Impact of Weather on German Retail Investors. *Review of Finance* 19 (3): 1143-1183.

SEC. 2016. Agency Financial Report, Fiscal Year 2016.

Shefrin, H., and M. Statman. 1985. The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence. *The Journal of Finance* 40 (3): 777-790.

Soltes, E.F. 2016. Why They Do It: Inside the Mind of the White-Collar Criminal. New York: *PublicAffairs*.

Sophos. 2007. Mass Pump-and-Dump Scam Causes Spam Level Surge. *Sophos*, published on August 8, 2007 [retrieved April 20, 2017]. Available from https://www.sophos.com/en-us/press-office/press-releases/2007/08/spam-pump.aspx.

———. 2008. Security Threat Report 2008.

Sterbenz, C. 2014. Penny Stocks: The Dark Side of the Legal Marijuana Boom. *Business Insider*, published on August 26, 2016 [retrieved April 1, 2017]. Available from http://www.businessinsider.com/marijuana-penny-stocks-2014-7.

van Rooij, M., A. Lusardi, and R. Alessie. 2011. Financial Literacy and Stock Market Participation. *Journal of Financial Economics* 101 (2): 449–472.

Welch, I. 2022. The Wisdom of the Robinhood Crowd. *The Journal of Finance* 77 (3): 1489-1527.

White, J.T. 2016. Outcomes of Investing in Otc Stocks. *SEC White Paper*.

Table 1: Investor Participation in Pump-and-Dump Schemes

This table provides evidence on investor participation in pump-and-dump schemes. Panel A shows how many of the 470 sample touts were traded. Our tout sample consists of two subsamples (BaFin and hand-collection). The table also provides statistics on the number of purchases made by all sample investors during the 60-day pump window for both roundtrip and holding period tout trades. Panel B provides summary statistics at the tout-level (number of investors per tout) and the investor-level (number of touts per investor). Panel C reports correlations between tout characteristics and investor participation in the tout using a linear probability model. The dependent variable *Tout Response* in Column (1) is coded as '1' if at least one investor in our sample participates in a certain tout and '0' otherwise. The independent variables are firm characteristics of the touted stock, the medium used for the tout and whether the tout is in the BaFin subsample. Market variables (returns and market value) are calculated over a 60-day period before the tout. In Column (2) to (4), we use the logarithm of the number of investors (plus 1) as the dependent variable. In Column (4), we include a manually-coded variable ranging from 0 to 3 that ranks the sophistication of the tout message. Higher values of this variable indicate a higher degree of sophistication (e.g., a more professional text). All t-statistics are based on standard errors clustered by month-year. *, **, and *** indicate significance (two-sided) at the 10%, 5%, and 1% levels, respectively.

Panel A: Trades in Pump-and-Dump Schemes

	N	*Mean*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
# purchases per tout during pump phase	385	77.72	199	2	5	18	61	158

Panel B: Number of Investors in Pump-and-Dump Schemes

	N	*Mean*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*	*Total Tout-Investments*
# investors per tout during pump phase	385	48.52	105	1	4	13	42	112	18,680
# touts per investor during pump phase	8,584	2.18	2.36	1	1	1	2	5	18,680

Panel C: Investor Response to Pump-and-Dump Schemes

	(1) Tout Response	*(2) Log(Number Investors)*	*(3) Log(Number Investors)*	*(4) Log(Number Investors)*
Tout HQ in Germany	0.095**	0.364*	0.391*	0.684**
	(2.13)	(1.93)	(1.90)	(2.38)
Tout on German Exchange	-0.064	-0.310	-0.207	-0.431
	(-1.10)	(-1.25)	(-0.78)	(-1.11)
Tout on US Exchange	-0.069	0.004	0.022	0.100
	(-1.26)	(0.01)	(0.08)	(0.28)
Utilized E-Mail	0.098**	0.414*	0.244	0.488*
	(2.00)	(1.68)	(0.96)	(1.71)
Utilized Telephone	-0.134***	-1.107***	-1.234***	-1.130***
	(-3.14)	(-5.73)	(-6.12)	(-3.81)
Utilized Newsletter	0.144***	1.154***	0.888***	0.873***
	(4.17)	(6.39)	(4.81)	(3.59)
Utilized Fax	-0.009	0.009	-0.213	0.273
	(-0.17)	(0.05)	(-1.07)	(0.76)
BaFin Tout Sample	0.138**	0.266	0.294	0.332
	(2.39)	(1.24)	(1.38)	(1.14)
Log(Market Value)			0.184***	
			(3.73)	
Returns			0.100	
			(0.93)	
Sophistication Tout Message				0.493***
				(4.31)
Constant	0.733***	2.045***	1.672***	1.339***
	(10.73)	(5.95)	(4.18)	(3.11)
Adj. R2	0.093	0.284	0.285	0.183
# Observations	470	470	397	254

Table 2: Investor Performance in Pump-and-Dump Schemes

This table provides descriptive statistics on the size and performance of tout investments. Panel A shows descriptive statistics on all tout trades during the 60-day pump period. Volume of investment refers to number of shares. Size of investment (measured in euro) is the number of shares multiplied by the market price at the time of purchase. Tout trades that are not closed out during our sample period are imputed to be closed out 120 days after the purchase date (these returns are calculated based on Datastream data). Market-adjusted returns are raw returns adjusted by the German CDAX index. Gross gain/loss is the investor's loss before fees. Panel B describes the returns for investors aggregating across all their trades in a particular tout. If indicated, variables are value-weighted by the size of the investment of each trade within a tout. Panel C provides performance statistics of investor's tout trades aggregated by all tout investments made by the investor. Returns are value-weighted across touts. Panel D provides statistics on investments in non-touted stocks that were made during the same 60-day pump period as the tout investment. These statistics refer to the 6,834 (out of 8,584) investors that made at least one non-tout investment during the 60-day pump period. We also provide the number different stocks purchased (distinct ISINs) during the 60-day pump period. Average investment size refers to the total investment amount divided by the distinct number of stocks purchased. All remaining rows are defined as in Panel C.

Panel A: Investor Performance at the Trade Level

	N	*Mean (per Trade)*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
Volume of investments (# shares)	29,922	6,138	38,017	200	500	1,400	4,000	10,000
Size of Investment (Euros)	29,922	4,026	16,234	443	944	1,915	4,000	8,250
Percent Return (raw)	29,922	-0.25	0.50	-0.84	-0.61	-0.22	0.02	0.20
Percent Return (market adjusted)	29,922	-0.28	0.52	-0.90	-0.63	-0.24	0.02	0.18
Gross gain/loss (Euros)	29,922	-770	5,572	-2,425	-985	-266	44	462

Panel B: Investor Performance at the Tout Level

	N	*Mean (per Tout)*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
Volume of investments (# shares)	18,680	9,832	99,995	250	700	2,000	5,000	15,000
Size of Investment in Tout (Euros)	18,680	6,449	26,740	476	1,002	2,200	5,130	11,966
Percent Return (raw, value-weight)	18,680	-0.28	0.48	-0.85	-0.64	-0.27	-0.01	0.15
Percent Return (market, value-weight)	18,680	-0.32	0.50	-0.91	-0.67	-0.29	-0.02	0.13
Gross gain/loss (Euros)	18,680	-1,234	7,440	-3,462	-1,376	-399	-10	437

Panel C: Performance of Tout Portion of Investor Portfolio

	N	*Mean (per Investor)*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
Number Different Tout Purchases	8,584	2.18	2.36	1	1	1	2	5
Number Tout Trades	8,584	4.68	13.38	1	1	2	4	10
Total Investment (Euros)	8,584	14,035	61,640	505	1,196	3,230	9,676	28,686
Average Return (raw, value-weight)	8,584	-0.31	0.45	-0.82	-0.62	-0.30	-0.06	0.10
Average Return (market, value-weight)	8,584	-0.35	0.47	-0.83	-0.63	-0.31	-0.06	0.09

Panel D: Performance of Non-Tout Portion of Investor Portfolio

	N	*Mean (per Investor)*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
Number Different Stocks Purchased	6,834	12.75	39.42	1	2	5	12	27
Number Non-Tout Trades	6,834	31.16	282	1	3	7	20	48
Total Investment (Euros)	6,834	121,013	1,707,072	1,558	4,459	14,968	50,631	136,327
Average Investment (Euro/different stocks)	6,834	6,027	20,376	682	1,354	2,753	5,399	11,161
Average Return (raw, value-weighted)	6,834	-0.04	0.33	-0.35	-0.15	-0.03	0.05	0.18
Average Return (market, value-weight)	6,834	-0.09	0.33	-0.39	-0.19	-0.06	0.01	0.11

Table 3: Characteristics of Tout and Non-Tout Investors

This table reports associations between various characteristics and the likelihood of becoming a tout investor using a linear probability model. The sample comprises up to 8,254 tout investors and 49,710 active non-tout (or control) investors with non-missing data. The latter group is randomly drawn from the sample of all investors in the month of a tout, who have never invested in a tout before, but purchased a non-touted stock during the 60-day pump period. A tout investor (control investor) can appear multiple times in the sample if they invest in multiple touts (are randomly drawn at different dates). The dependent variable is equal to '1' if the investor is a tout investor and '0' otherwise. The explanatory variables refer to investor, district, portfolio and trading characteristics as well as the investor's profession. *Male* is an indicator equal to '1' if the investor's gender is male. *Married* is an indicator equal to '1' if the investor is married. *Age* is the investor's age at the tout date. *Self-assigned Risk Class* is a measure for the investor's risk tolerance and has a value between 1 and 5. It is self-assigned by the investor; 5 indicates the highest inclination toward taking financial risk. *Account Wealth* is the total Euro value of the investor's portfolio and deposit account. *Penny Share* is defined as the percentage of the portfolio that is invested in penny stocks (defined as stocks with share price below €5 that are not in major stock indices). *Blue Chip Share* is the percentage of the portfolio invested in stocks that are in the S&P500 and the Euro STOXX 600 indices. # *Purchases* is the number of stock purchases. *Return Deciles* is the average return of the investor's portfolio, ranked by deciles. *SD_Return Deciles* is the standard deviation of returns in the investor's portfolio, ranked by deciles. *HHI Stock Portfolio* is a measure for the concentration of the investor's stock portfolio using the Herfindahl-Hirschman index. *City* is an indicator equal to '1' if the population density of an investor's zip code is larger than 500 people per square kilometer. *East Germany* is an indicator variable that captures whether an investor lives in one of the five states that comprised the former German Democratic Republic. *% Graduate Education* is the percentage of the population within the investor's district that graduated from college based on 2011 census data. *% Unemployment* is the unemployment rate within an investor's district based on 2011 census data. All professions are self-reported by investors. The omitted professional category is "dependents and others". When indicated, we measure variables one month before the tout date (t-1) or over the prior year ([t-12, t-1]. Variables without a subscript are static variables. When indicated, we use the logarithm of the variable (plus 1). Fixed effects are included for the month-year of the investment. These fixed effects control for general time trends in pump-and-dump scheme investments and market-level returns (see Section 3.1). All t-statistics, included in parentheses, are based on standard errors double-clustered at the investor and month-year level. *, **, and *** indicate significance (two-sided) at the 10%, 5%, and 1% levels, respectively.

(Continued)

Table 3 (Continued)

	(1) *Tout Investor*	*(2)* *Tout Investor*	*(3)* *Tout Investor*	*(4)* *Tout Investor*	*(5)* *Tout Investor*
Personal Characteristics					
Male	0.016***	0.013***	0.006*	0.007**	0.008**
	(4.34)	(3.62)	(1.76)	(2.12)	(2.23)
Married	-0.004	-0.000	0.001	-0.001	0.001
	(-1.36)	(-0.08)	(0.36)	(-0.48)	(0.21)
Age_t	0.002***	0.002***	0.002***	0.002***	0.001***
	(7.99)	(8.45)	(8.10)	(7.83)	(5.22)
Self-assigned Risk Class	0.013***	0.007***	-0.000	0.000	0.003**
	(8.32)	(6.29)	(-0.33)	(0.30)	(2.33)
Log(Account $Wealth_{t-1}$)	-0.024***	-0.016***	-0.017***	-0.017***	-0.017***
	(-10.64)	(-8.76)	(-10.48)	(-10.73)	(-10.83)
Portfolio Characteristics					
Penny $Share_{t-1}$		0.259***	0.197***	0.194***	0.193***
		(9.03)	(8.77)	(8.82)	(8.79)
Blue Chip $Share_{t-1}$		-0.094***	-0.072***	-0.072***	-0.072***
		(-8.65)	(-8.16)	(-8.37)	(-8.40)
Log(# $Stocks_{t-1}$)		0.009***	-0.002	-0.001	-0.002
		(3.81)	(-0.67)	(-0.47)	(-0.57)
Behavioral Characteristics					
Log (# $Purchases_{[t-12,t-1]}$)			0.032***	0.031***	0.030***
			(9.43)	(9.35)	(9.41)
Return $Deciles_{[t-12,t-1]}$			-0.007***	-0.007***	-0.007***
			(-4.75)	(-4.83)	(-4.82)
SD_Return $Deciles_{[t-12,t-1]}$			0.011***	0.011***	0.011***
			(7.08)	(7.11)	(7.09)
HHI Stock $Portfolio_{t-1}$			-0.080***	-0.081***	-0.082***
			(-7.70)	(-7.76)	(-7.82)
District Characteristics					
City				-0.011***	-0.011***
				(-2.94)	(-2.92)
East Germany				0.013**	0.013**
				(2.28)	(2.21)
% Graduate $Education_{2011}$				-0.001***	-0.001***
				(-3.63)	(-3.59)
% $Unemployment_{2011}$				0.000	0.000
				(0.21)	(0.22)
Job Characteristics					
White-collar Job					-0.012**
					(-2.27)
Blue-collar Job					0.003
					(0.32)
Retiree					0.016**
					(2.09)
Civil Servant					-0.019***
					(-2.63)
Managerial Position					-0.018**
					(-2.51)
Self-employed					0.006
					(0.89)
Not disclosed (NA)					0.021***
					(2.78)
Fixed Effects	Month	Month	Month	Month	Month
Adj. R2 (within)	0.020	0.087	0.127	0.125	0.127
Number of Investors	54,776	53,973	53,379	48,383	48,383
# Observations	170,956	167,062	165,377	149,996	149,996

Table 4: Multi-Tout Investors and their Performance

This table provides descriptive statistics on unique tout investors grouped and sorted by the number of their tout investments over the sample period. *% Return* are value-weighted across touts (i.e., within investor) and equally-weighted across investors. *Euro Return* measures the cumulative gains/losses over all tout investments. *Investment* is the average Euro investment amount per tout (equally-weighted across touts and investors) and is calculated as the number of shares multiplied by the market price at the time of purchase. See notes of Table 3 for the other variable definitions.

# of Touts Invested	N	% Return		Euro Return		Investment (Euro)		Penny Share		Blue Chip Share	
		Mean	p50	Mean	p50	Mean	p50	Mean	p50	Mean	p50
1	5,049	-0.34	-0.37	-1,249	-428	4,753	1,758	0.23	0.10	0.19	0.07
2	1,503	-0.30	-0.31	-2,406	-991	4,927	2,340	0.31	0.21	0.14	0.05
3	708	-0.27	-0.26	-4,619	-1,485	6,643	2,711	0.34	0.25	0.12	0.04
4	417	-0.28	-0.26	-4,918	-2,298	5,561	2,977	0.34	0.27	0.11	0.04
5	268	-0.23	-0.23	-5,695	-2,559	6,642	3,393	0.37	0.33	0.09	0.02
6	196	-0.25	-0.21	-7,870	-4,454	7,992	3,801	0.37	0.33	0.09	0.04
7 or more	443	-0.23	-0.19	-10,682	-6,830	8,702	4,573	0.41	0.36	0.09	0.03
Total	8,584	-0.31	-0.31	-2,685	-745	5,315	2,100	0.28	0.16	0.16	0.05

Table 5: Investor Returns in Pump-and-Dump Schemes

This table reports results from a regression analysis of tout investor returns. In Column (1), we include personal- and portfolio-level variables as defined in Table 3. The dependent variable *Mean Return (%)* is the average percentage return to an investor in a specific tout. In Column (2), we add *Multi-Tout Investor*, which is an investor-level indicator variable, coded as '1' if an investor participates in at least four different touts during our sample period. Investor- and tout-fixed effects are included in Column (3). *# Days After Begin* is defined as the number of days between the investor's first trading date in the focal tout and the beginning of the tout campaign. We take the natural logarithm of this variable (plus 1). *Number of Tout* is a discrete variable that captures how many touts an investor participated in until (and including) the focal tout. To determine this variable, touts are sorted within each investor based on the final closing date of each tout (actual date of sale or a maximum closing date of 120 days for 'inventory investments' or long 'round-trip investments'). In line with Table 4, the maximum value of this variable is capped at 7. All t-statistics, included in parentheses, are based on standard errors double-clustered at the investor and month-year level. *, **, and *** indicate significance (two-sided) at the 10%, 5%, and 1% levels, respectively.

	(1) *Mean Return (%)*	*(2)* *Mean Return (%)*	*(3)* *Mean Return (%)*
Multi-Tout Investor		0.068***	
		(3.92)	
Log(# Days after Begin)			-0.051***
			(-4.82)
Number of Tout			-0.030***
			(-6.03)
Male	-0.012	-0.015	
	(-0.83)	(-1.02)	
Married	-0.014	-0.015	
	(-1.48)	(-1.61)	
Age (at tout date)	-0.001	-0.001**	
	(-1.21)	(-2.00)	
Self-assigned Risk Class	-0.001	-0.002	
	(-0.22)	(-0.70)	
Log(Account Wealth(t-1))	-0.002	-0.002	0.011*
	(-0.31)	(-0.39)	(1.66)
Penny Share (t-1)	0.080***	0.062**	-0.001
	(2.99)	(2.26)	(-0.07)
Blue Chip Share (t-1)	-0.034	-0.016	-0.010
	(-0.83)	(-0.42)	(-0.30)
Log(# Stocks (t-1))	-0.036***	-0.038***	-0.011
	(-4.21)	(-4.51)	(-1.20)
Fixed Effects	NO	NO	Investor & Tout
Adj. R2	0.013	0.017	0.396
Number of Investors	8,115	8,115	3,409
# Observations	17,583	17,583	13,065

Table 6: Investor Types Trading in Touted Stocks

This table classifies investors into five different investor types based on their trading behavior in *non-touted stocks* during the 180 days before each tout. Panel A provides the definitions and descriptions of these five different investor types. Panel A also shows the percentage of tout investors that fall into each investor type category at the point of investing in his or her first tout relative to the corresponding percentage for active control investors (see Table 3 for details on control investors). We iteratively assign investors into each investor type category in Panel A, resulting in mutually exclusive investor types. In Column (1) and (2) of Panel B, we supplement prior analyses of Table 3 and Table 5 by adding dummies for each investor type to the regressions. In Column (3), the dependent variable indicates whether an investor invests in multiple touts ('1') or only in a single tout ('0') over our sample period. The dependent variable in Column (4) is an indicator variable that is coded as '1' if the tout investment is less than 2.38% of the investor's overall portfolio value (set at value of lowest quintile). In all columns, the omitted category is *Intermediate Type*. In all regressions, we include personal and portfolio characteristics as defined in Table 3. In line with Panel A, we use mutually exclusive investor type definitions, assigning investors sequentially from I to V. All t-statistics, included in parentheses, are based on standard errors double-clustered at the same level as in the underlying analyses (and by investor and month-year in Column 4). *, **, and *** indicate significance (two-sided) at the 10%, 5%, and 1% levels, respectively.

Panel A: Different Investor Types

		Description	*Tout-Investors (N = 8,584)*	*Control Investors (N = 52,216)*	*p-value*
I.	*New Trader*	First-time use of brokerage account in the 180 days before the tout	7.6%	11.3%	*< 0.01*
II.	*Conservative Trader*	Fewer than three trades in the 180 days before the tout	29.2%	55.6%	*< 0.01*
III.	*Day Trader*	At least three day trades in the 180 days before the tout	5.2%	0.9%	*< 0.01*
IV.	*Short-term Trader*	Flipped at least three stocks within a week in the 180 days before the tout	14.4%	4.0%	*< 0.01*
V.	*Intermediate Type*	Not a member of the other four investor-type groups (more than three trades, but not a *Day Trader* or *Short-term Trader*)	43.6%	28.2%	*< 0.01*
			100%	*100%*	

Panel B: Explanatory Power of Investor Types

	(1) Tout Investor	*(2) Mean Tout Return (%)*	*(3) Log(# Days Duration)*	*(4) Small Investment*
New Trader	0.001	0.020	-0.175*	-0.081***
	(0.11)	(0.77)	(-1.68)	(-6.04)
Conservative Trader	-0.039***	-0.042***	0.269***	0.019**
	(-7.03)	(-3.37)	(8.20)	(2.32)
Day Trader	0.229***	0.216***	-1.513***	-0.050***
	(9.65)	(8.87)	(-33.76)	(-3.55)
Short-term Trader	0.103***	0.131***	-0.727***	-0.069***
	(6.60)	(8.11)	(-16.81)	(-6.40)
Controls				
Personal Characteristics	Yes	Yes	Yes	Yes
Portfolio Characteristics	Yes	Yes	Yes	Yes
Adj. R2	0.118	0.039	0.209	0.204
# Investors	53,973	8,115	8,115	8,115
# Observations	167,062	17,583	17,583	17,583

Table 7: Effect of Supervisory Warnings on Tout Investor Behavior

This table examines the effect of public warnings by the supervisory authority BaFin on purchase behavior in touted stocks. In both panels, we focus on the number of unique investors purchasing a touted stock on a given day over the [0, 60] tout period. In both panels, Column (1) shows the results for all traders. In Column (2) and (3) we split the investor types in two groups: In Column (2), we retain only "regular" traders (i.e., combining investor types I, II, and V from Table 6), and in Column (3) we retain only "frequent" traders (i.e., combining investor types III and IV). In Panel A, we use all BaFin touts and include fixed effects for tout and event time. We retain only the 221 (out of 258) BaFin touts with active trading. In Panel B, we focus on the 21 touts for which BaFin issued a warning and include tout fixed effects. *BaFin Warning* is a dummy variable coded as '1' for days following a public warning by BaFin (and '0' otherwise). *Enter – Warning Day* is the running variable, which counts the number of days between the investor's entry date and the *BaFin Warning*. All t-statistics, included in parentheses, are based on standard errors clustered by tout. *, **, and *** indicate significance (two-sided) at the 10%, 5%, and 1% levels, respectively.

Panel A: Impact of BaFin Warning Trading in a Staggered Difference-in-Differences Design

	(1)	*(2)*	*(3)*
	Log(# Investors + 1)	*Log(# Investors + 1)*	*Log(# Investors + 1)*
Sample Restriction:	*All Traders*	*Regular Traders*	*Frequent Traders*
Test Variable:			
BaFin Warning	-0.290***	-0.280***	-0.084*
	(-3.63)	(-3.87)	(-1.80)
Fixed Effects	Tout & Event-Time	Tout & Event-Time	Tout & Event-Time
# Touts (BaFin)	221	221	221
# Observations (Tout-Day)	13,481	13,481	13,481
Adj. R^2	0.318	0.287	0.349

Panel B: Impact of BaFin Warning in a Local Linear Regression Discontinuity Design

	(1)	*(2)*	*(3)*
	Log(# Investors + 1)	*Log(# Investors + 1)*	*Log(# Investors + 1)*
Sample Restriction:	*All Traders*	*Regular Traders*	*Frequent Traders*
Test Variable:			
BaFin Warning	-0.353***	-0.355***	-0.093*
	(-3.46)	(-3.37)	(-2.00)
Controls:			
(Enter – Warning Day)	0.013***	0.012***	0.004**
	(2.90)	(2.88)	(2.60)
(Enter – Warning Day) x BaFin Warning	-0.019***	-0.017***	-0.007***
	(-3.88)	(-3.68)	(-3.52)
Fixed Effects	Tout	Tout	Tout
# Touts (Bafin)	21	21	21
# Observations (Tout-Day)	1,281	1,281	1,281
Adj. R^2	0.244	0.205	0.267

Table 8: Subsequent Tout Investments

This table examines subsequent investments in pump-and-dump schemes with respect to the return of prior touts, portfolio and tout characteristics. We keep only non-overlapping tout observations and, to alleviate right censoring, we restrict the analysis to touts before 2013. The dependent variable in Column (1) and (2) is an indicator variable that takes the value of '1' if an investor invests into at least one subsequent tout later in the sample period (for the sorting procedure of the touts see notes of Table 5). In Column (1), we restrict the sample to the first tout of each investor. *Decile Return (Current Tout)* is the investor's decile-ranked tout return with higher rank indicating higher returns. All remaining variables are defined as in Table 3. In Column (2), we add a lagged decile-ranked return variable (i.e., decile-ranked return of the previous tout) and restrict the sample to the first four tout observations of each investor (the first tout automatically drops from the sample as the return of the previous tout is missing). In Column (3) to (4), we additionally restrict the sample to tout-investor observations that resulted into at least one subsequent tout investment of the investor during the sample period. In Column (3), the dependent variable is the natural logarithm of the number of days between the closing of the most recent tout and the investment into the subsequent tout (plus 1). The dependent variable in Column (4) is an indicator variable that is coded as '1' if the next tout investment has a longer duration than the most recent tout investment. All regressions include personal and portfolio characteristics, as defined in Table 3, as well as investor types, as defined in Table 6. Coefficients for personal characteristics are not reported for brevity. All t-statistics, included in parentheses, are based on standard errors double-clustered at the investor and month-year level. *, **, and *** indicate significance (two-sided) at the 10%, 5%, and 1% levels, respectively.

	(1) *Another Tout Investment*	*(2)* *Another Tout Investment*	*(3)* *Log(# Days Next Tout)*	*(4)* *Increase Duration*
Decile Return (Current Tout)	0.020***	0.027***	-0.108***	0.046***
	(6.29)	(6.84)	(-4.31)	(6.05)
Decile Return (Previous Tout)		0.002	-0.037***	0.001
		(0.66)	(-3.17)	(0.46)
Penny Share (t-1)	0.186***	0.070**	0.097	-0.028
	(4.75)	(2.30)	(0.70)	(-0.79)
Blue Chip Share (t-1)	-0.133***	-0.182***	-0.304*	-0.053
	(-5.19)	(-3.98)	(-1.96)	(-0.75)
Log(# Stocks (t-1))	0.028***	0.026**	0.118***	-0.008
	(3.88)	(2.38)	(2.92)	(-0.41)
New Trader	0.052**	0.092	-0.361***	-0.034
	(2.05)	(1.35)	(-3.03)	(-0.89)
Conservative Trader	-0.093***	-0.150***	-0.023	-0.066**
	(-4.84)	(-5.75)	(-0.18)	(-2.23)
Day Trader	0.143***	0.151***	-0.417***	-0.001
	(6.08)	(4.47)	(-3.56)	(-0.03)
Short-term Trader	0.089***	0.059**	-0.235***	0.015
	(6.06)	(2.60)	(-3.13)	(0.62)
Controls				
Personal Characteristics	Yes	Yes	Yes	Yes
Sample	1st Tout	2nd-4th Touts	2nd-4th Touts	2nd-4th Touts
Adj. R2	0.092	0.082	0.126	0.0637
# Investors	7,915	2,888	1,413	1,413
# Observations	7,915	4,962	2,520	2,520

Table 9: Long-term Changes to Portfolio Investments after Pump-and-Dump Experience

This table examines long-term changes in tout investor portfolios after they experience a pump-and-dump scheme. We focus on *Regular Traders* (i.e., investor types I, II and V in Table 6) in the treatment and control group after their first tout investment in our sample. We construct a panel dataset centered on the (matched) tout month, measuring the respective portfolio variables every 12 months, starting 6 months before and continuing after the tout. In Panel A, we examine whether tout investors' portfolios change after the tout investment. In Column (1) and (4), the dependent variable is *Stop Participation*, which is an indicator variable marking that the investor closes their account or the portfolio value falls below €1,000. In Column (2) and (5), we use *Log(Value of Blue Chip Stock)*, which is the value of the investor's S&P500 and Euro STOXX 600 stocks. The dependent variable in Column (3) and (6) is *Log(Value of Funds),*which is the value of the investor's total fund investments. The variable of interest is the interaction term between the indicator variables *Tout Investor* and *Post Tout*. All regressions include investor and the interaction of event-time and tout-month fixed effects, which subsume the main effects of our test variable. We add additional fixed effects by interacting all personal and portfolio characteristics from Table 3 with an event-time indicator (after coarsening continuous personal and portfolio characteristics into percentiles). Where indicated, we match tout investors to control investors within the same month using entropy balancing using the personal, portfolio and return characteristics as matching variables. For return characteristics, we match on the investor's portfolio gross return over the last 12 months before as well as portfolio returns 12 months after the tout. In Panel B, we map out the treatment coefficient over time by interacting *Tout Investor* with an event-time indicator. The omitted interaction term is the investor's portfolio six months before the tout, which is subsumed by the fixed effects. In both panels, we include only investor observations with non-missing and non-zero portfolio values in the pre-period. All t-statistics, included in parentheses, are based on standard errors double-clustered at the investor and month-year level. *, **, and *** indicate significance (two-sided) at the 10%, 5%, and 1% levels, respectively.

Panel A: Long-term Portfolio Changes following Tout Experience

	(1) Stop Participation	*(2) Log(Value of Blue Chip Stock)*	*(3) Log(Value of Funds)*	*(4) Stop Participation*	*(5) Log(Value of Blue Chip Stock)*	*(6) Log(Value of Funds)*
Tout Investor x Post Tout	0.018***	-0.864***	-0.311***	0.012***	-0.741***	-0.217***
	(5.13)	(-12.87)	(-4.32)	(3.43)	(-9.59)	(-3.22)
Fixed Effects	Investor & Event-Time-Month & Event-Time x [Personal and Portfolio Characteristics]					
Matching	NO	NO	NO	Personal, Portfolio and Return Characteristics	Personal, Portfolio and Return Characteristics	Personal, Portfolio and Return Characteristics
Adj. R2	0.446	0.585	0.702	0.426	0.592	0.699
# Investors	46,562	46,558	46,558	41,458	41,458	41,458
# Observations	360,185	360,103	360,104	323,968	323,967	323,968

Panel B: Long-Term Dynamics following Tout Experience

	(1) Stop Participation	*(2) Log(Value of Blue Chip Stock)*	*(3) Log(Value of Funds)*	*(6) Stop Participation*	*(4) Log(Value of Blue Chip Stock)*	*(5) Log(Value of Funds)*
Tout Investor x -42 Months	0.001	0.148**	-0.178**	0.003	0.082	-0.074
	(0.29)	(2.25)	(-2.47)	(0.44)	(0.92)	(-1.13)
Tout Investor x -30 Months	0.006	0.117**	-0.151**	0.012**	0.085	-0.062
	(1.24)	(1.98)	(-2.34)	(2.06)	(1.16)	(-0.89)
Tout Investor x -18 Months	0.000	0.061	-0.142***	-0.003	-0.024	-0.085
	(0.03)	(1.16)	(-3.16)	(-0.77)	(-0.40)	(-1.64)
Tout Investor x +6 Months	0.006**	-0.749***	-0.323***	0.006	-0.675***	-0.179***
	(2.04)	(-10.98)	(-6.44)	(1.52)	(-8.55)	(-3.13)
Tout Investor x +18 Months	0.016***	-0.817***	-0.460***	0.014***	-0.770***	-0.308***
	(4.36)	(-9.88)	(-7.03)	(2.98)	(-8.62)	(-4.81)
Tout Investor x +30 Months	0.026***	-0.799***	-0.428***	0.015**	-0.721***	-0.267***
	(4.53)	(-11.10)	(-5.86)	(2.63)	(-8.17)	(-3.25)
Tout Investor x +42 Months	0.030***	-0.793***	-0.471***	0.024***	-0.674***	-0.321***
	(5.21)	(-10.10)	(-6.13)	(4.36)	(-6.91)	(-3.83)
Fixed Effects	Investor & Event-Time-Month & Event-Time x [Personal and Portfolio Characteristics]					
Matching	NO	NO	NO	Personal, Portfolio and Return Characteristics	Personal, Portfolio and Return Characteristics	Personal, Portfolio and Return Characteristics
Adj. R2	0.446	0.585	0.702	0.426	0.592	0.699
# Investors	46,562	46,558	46,558	41,458	41,458	41,458
# Observations	360,185	360,103	360,104	323968	323,967	323,968

Figure 1: Example for a Pump-and-Dump Campaign – BAR.bra Mining Group AG

This figure shows the price path of "BAR.bra Mining Group AG" (ISIN: CH0032823640). At December 5, 2007, the stock was authorized for trading on the *Open Market* of the Frankfurt stock exchange, a less strictly regulated market segment. Stock promoters started touting the stock in early January 2008. Accordingly, the price increased from €0.46 at its inception to its maximum of €0.87 at January 15, 2008. Within less than three months, the stock lost most of its value (€0.04 at April 15, 2008) and is basically worthless ever since.

Figure 2: Frequency of Pump-and-Dump Schemes over Time

This figure shows the frequency of touts as well as the source of the data by year. The sample period begins in 2002 and ends in January 2015.

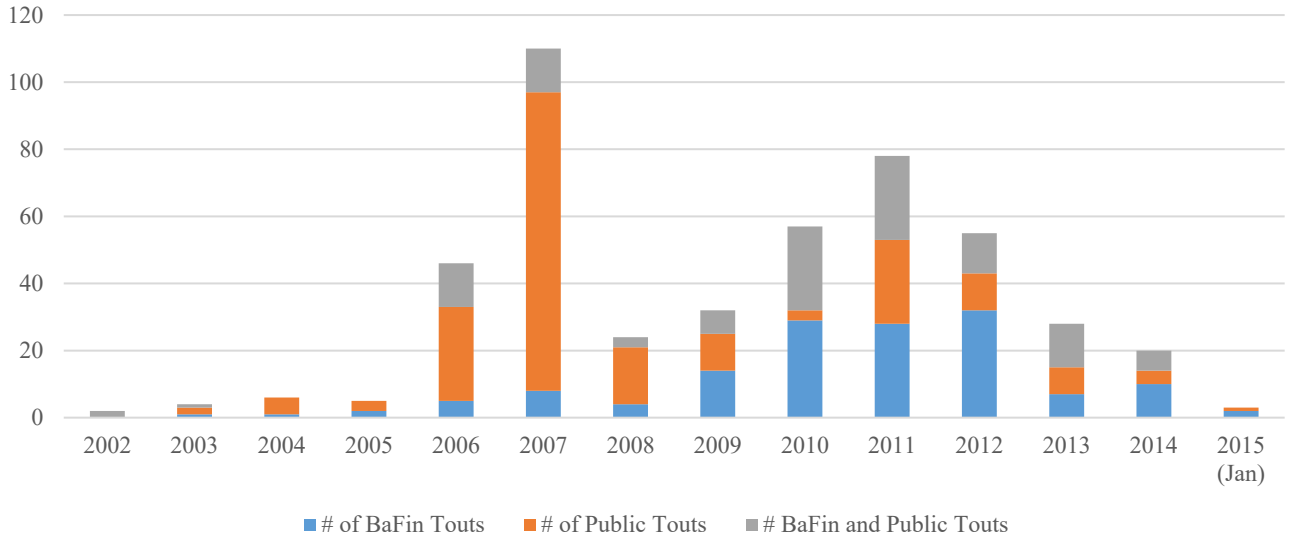
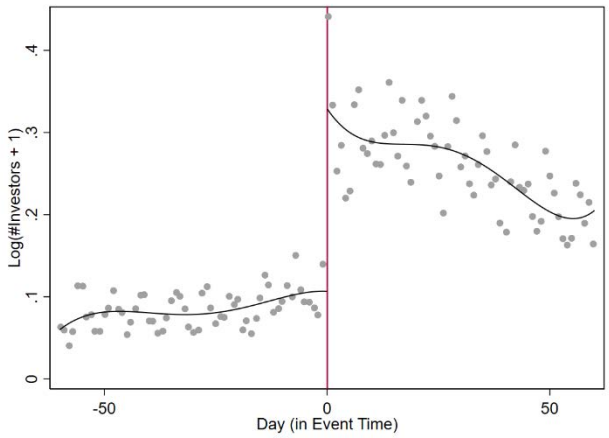
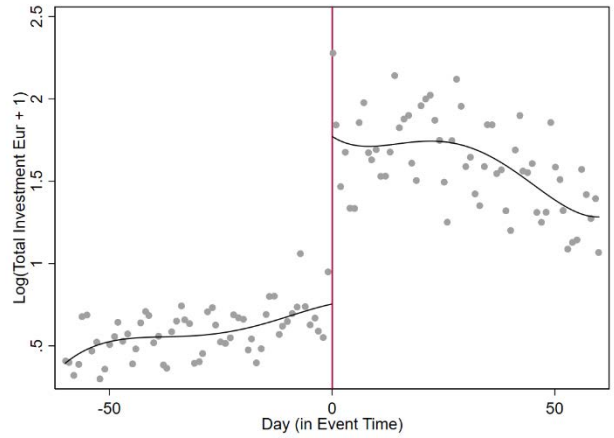


Figure 3: Regression Discontinuity Analysis around the Tout Date for Touted Stocks

This figure shows the discontinuity in the investment behavior of investors within our brokerage sample (Panel A) and the *lack* of a discontinuity in prices (Panel B) around the tout date. Day 0 indicates the beginning of the tout period. In Panel A, the outcome variables are the logged number of unique investors and the logged total investment in Euro in a given stock on a given day. In Panel B, we show logged share prices based on Datastream data (we use log+1 as a significant number of stocks has share prices below €1, which would lead to a heavily skewed distribution otherwise). We use data-driven regression discontinuity plots following Calonico, Cattaneo and Titiunik (2015), resulting in polynomials of order 4.

Panel A: Investor Response around Tout Date





Panel B: Price Path around Tout Date

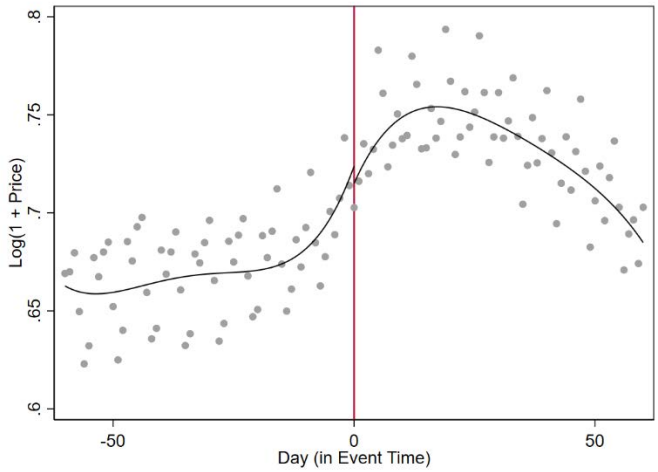
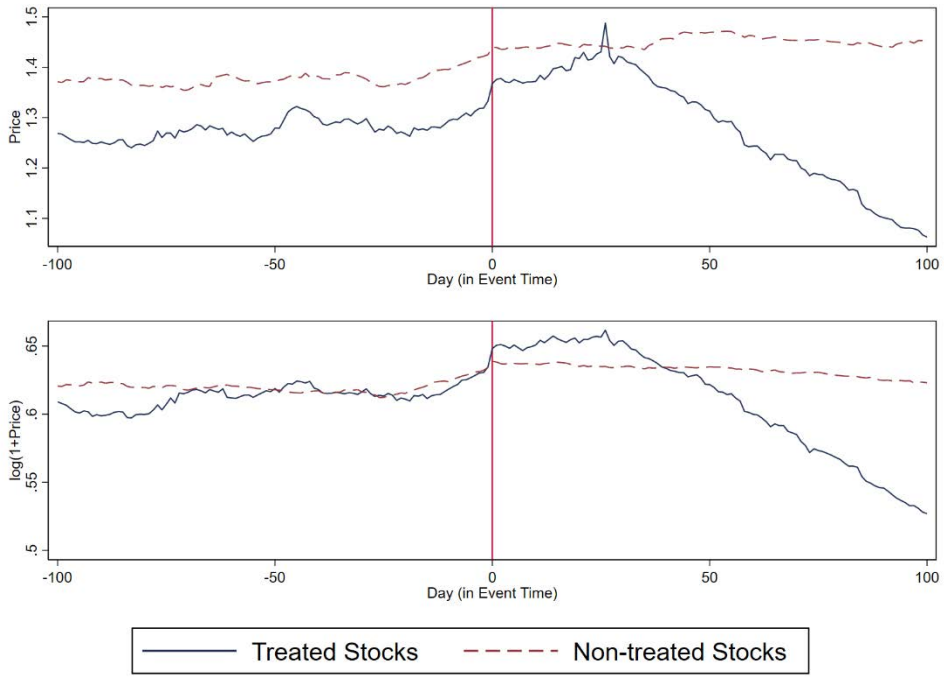


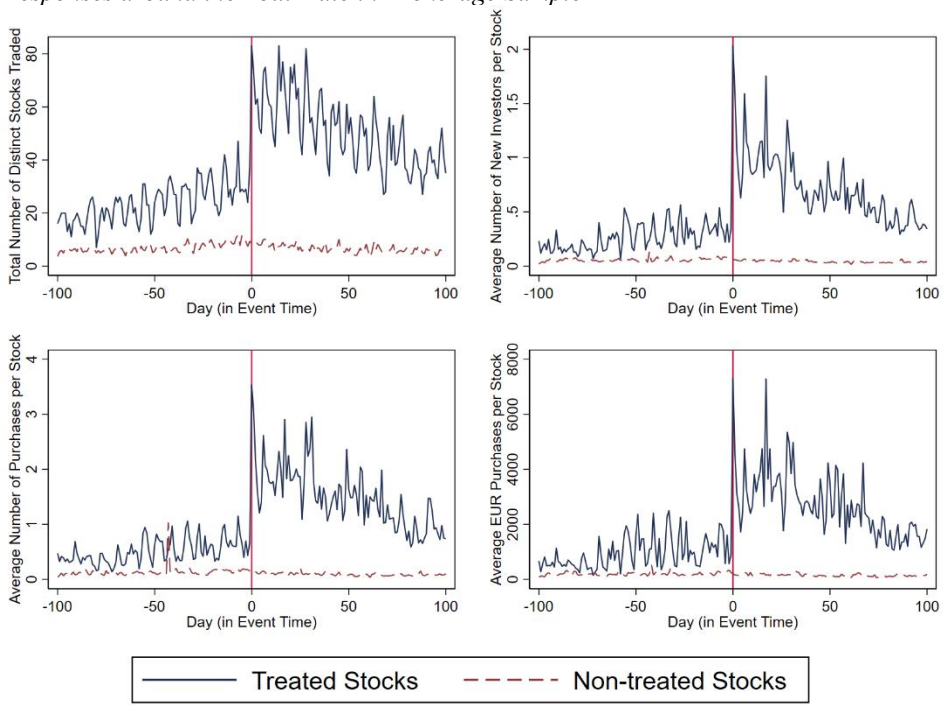
Figure 4: Investor Trading of Price-Path Matched Touted and Non-Touted Stocks

This figure shows the price path and investor trading responses for coarsened-exact matched touted stocks and non-touted control stocks. Stocks are matched based on their initial share price levels using five different price strata and on return quartiles over two 25-day intervals before the beginning of the tout. See Internet Appendix for more information. Panel A shows the price path of touted and non-touted stocks using unadjusted and logged prices. For logged prices, we use log(1+Price) as a significant number of stocks has share prices below €1, which would lead to a heavily skewed distribution otherwise. Returns for touted and control stocks do not significantly differ up to 50 days before the tout date. Panel B shows the within-sample trading response by investors in the brokerage sample using four different measures to capture trading activity.

Panel A: Price Path of Touted and Matched Stocks



Panel B: Investor Responses around the Tout Date in Brokerage Sample



Internet Appendix:

Who Falls Prey to the Wolf of Wall Street? Investor Participation in Market Manipulation

September 2023

Appendix A: Hand-Collected Pump-and-Dump Schemes

A.1 Search Process

This section describes our procedure to identify pump-and-dump schemes beyond those provided by BaFin. The goal is to identify additional pump-and-dump schemes that have targeted German investors, but were not investigated by BaFin. Towards this end, we conducted a Google-search using a variety of different German search terms that could identify tout promotions (such as "*Aktien-Spam*" [stock spam], "*Betrug E-Mail*" [fraud e-mail], "*ungefragte Aktienempfehlungen*" [unsolicited stock recommendation], *"Abzocke Aktien*" [stock scam], "*Insider-Tipp Aktie*" [stock insider tip]). We then manually went through the first 100 search results of each search term and identified three potentially valuable information sources: (1) consumer protection webpages; (2) financial news websites and their message boards; (3) other webpages and blogs. The first source (1) comprises websites on which individuals complain about stock spamming incidents via unsolicited e-mail, fax, or telephone calls and which seem to be linked with consumer protection initiatives. Once we identified such a website, we went through their archives to identify relevant pump-and-dump schemes. In total, we identified 13 such consumer protection webpages. In one case ("*Verbraucherzentrale Nordrhein-Westfalen*"; consumer protection agency of the state North Rhine-Westphalia), we also contacted the administrators of the webpage and directly obtained their archive of all stock spam complaints. We included cases in the hand-collected subsample only if we also found the original tout message or a detailed description of the stock spam message.

The second information source comprises websites containing financial information about stocks and message boards for discussions between retail investors. We found 9 such webpages on which users discussed or complained about potentially illegal stock promotions. We included cases in our hand-collected subsample if we could identify the approximate content of the tout and were able to determine whether the tout was e-mailed or faxed to the receivers.[1] For all message boards, we browsed the thread, in which we found the original stock promotion (via our Google search) and investigated the prior three nodes of the message board to identify any further cases. In this process, we also researched further potential tout cases that were mentioned in message boards or by the media during the discussion of other pump-and-dump campaigns.

Third, we included tout cases that we found on various other websites and blogs via our Google search. This third source comprises 46 websites. Most of these websites explain the risk of trading based on dubious stock spam and provide examples as illustrations. We also browsed these websites to identify further tout cases. However, few webpages of this type yielded more than the one case that came up in the original Google search that brought us to this site.

Since we were using German search terms for our Google search, the resulting source websites mostly had their domain in Germany. However, the tout messages themselves were sometimes in English. We include these English stock spams if the tout message was discussed on German-domain websites as the campaign presumably also targeted German investors. To further round out our sample construction, we searched for U.S. stock promotions and touts on U.S. websites, finding the most comprehensive list on *OTC Today*. Although most of these U.S. pump-

[1] While we make a distinction between newsletters and e-mail spam in our analyses, it is rather difficult to neatly differentiate between these two types of tout campaigns in our hand collection, in particular, when we rely on indirect information to determine the medium of the tout. For example, spam e-mails are often designed as legitimate investment newsletters and it is hard to determine whether the newsletter was originally sent to subscribers only. Additionally, newsletters are sometimes reposted on message boards or subsequently sent as spam e-mails to reach a bigger audience beyond the original subscribers of the newsletter. These issues do not arise in the BaFin sample as they provide us with a classification based on their tout investigation.

and-dump schemes did not target German investors, some of these touts were indeed "recycled" for German investors. To identify these schemes, we identified a pool of candidate schemes with German participation and then used the same sources and applied the same search criteria as described for the German touts (i.e., tout messages or complaints by investors or on German websites or message boards for these touts).[2] Through this process, we were able to identify 17 additional cases.

In total, our process yields a hand-collected sample of 320 unique stock spam messages, in which 311 distinct stocks were promoted to a German audience between December 2002 and January 2015. We use the date on which the e-mail was allegedly sent or the phone call placed to determine the beginning of the pump-and-dump campaign. If this date is not available, we use the date on which the stock spam complaint or the promotional message was posted on the respective webpage or message board. We classify all stocks mentioned in a promotional message as touted stocks and do not require that the touted stocks are penny stocks or traded on specific venues.

To better illustrate our search process, we provide four examples of tout cases that we identified using this strategy. These examples illustrate German (A2 and A4) and U.S. stocks (A3 and A5) with German (A2, A3 and A4) and English tout messages (A5), respectively. Furthermore, we compare the BaFin sample with the hand-collected sample in terms of investor participation and performance in Appendix B.

[2] Specifically, we created a candidate pool of 'salient' U.S. touts that were potentially recycled or promoted in Germany by identifying the numbers of investors who traded the respective stock in our German brokerage sample. About 70% of the cases from our candidate pool of US touts stem from *OTC Today.* The remaining cases are assembled from nine different sources with Pink Sheet's Caveat Emptor label (16%) and Spamnation (6%) being the most relevant ones. We require that at least 10 sample investors traded the promoted stock in a 60-day window around the alleged U.S. promotion date for the tout to enter the candidate pool. For these more salient U.S. touts, we then applied the same search criteria as for the German stock promotions. This two-step procedure eliminates 'false positives' (i.e., U.S. stocks that were not promoted in Germany) and keeps the hand-collection process manageable. That is, we examined 34 candidate cases instead of several thousand U.S. stock promotions, most of which would not be relevant. However, this process uses participation by at least a few German investors as a criterion to identify candidates. We obtain very similar results if we drop the resulting 17 cases that satisfy our sample criteria. We also re-run our analyses using only touts from the BaFin sample and find consistent results throughout.

A.2 Example Amatech AG

Company:	Amatech AG
Date of first message:	March 2, 2007
Further occurrences:	March 4, 2007; March 5, 2007; March 18, 2007
Sources:	• http://de.admin.net-abuse.mail.narkive.com/I4UVTlbg/joe-job-gegen-uceprotect • http://www.tradingideas.de/2007/03/18/amatech-txade-wkn-519280/ • http://www.achtung-aktie.de/index.htm?grundwissen.htm
ISIN:	DE0005192801 (not in original tout message)
Type:	E-mail
Tout Message:	*Die sensationelle 1000% Chance - jetzt einsteigen und richtig Geld verdienen* *Sehr geehrte Damen und Herren,* *hiermit machen wir Sie auf die aktuelle Kursrakete AMATECH AG aufmerksam und empfehlen unbedingt eine Aufnahme in Ihr Depot: Der DAX sinkt, Amatech steigt* *AMATECH Aktiengesellschaft* *Rosbergweg 2* *87459 Pfronten* *WKN 519280* *Tageskurs: 20 Cent* *7-Tage-Ziel: 70 Cent* *Monatsziel: 1,20 Euro* *Bewertung: Strong Buy* *Laut unserer Chartanalyse hat die Aktie enormes Potential. Jetzt einsteigen und keine Zeit verlieren.* *Hochachtungsvoll* *[NAME]*

A.3 Example HUMET-PBC NA

Company:	HUMET-PBC NA
Date of first message:	March 31, 2007
Further occurrences:	April 1, 2007 to April 5,2007; April 6, 2007; April 8, 2007; April 10, 2007
Sources:	• http://www.cbr1000rr.de/fireblade_forum/index.php?page=Thread&threadID=43595 • http://www.antispam-ev.de/forum/archive/index.php/t-14878.html • http://www.tradingideas.de/2007/03/31/humet-pbc-l9z-wkn-a0jdw0/
ISIN:	US4454081070
Type:	E-mail
Tout Message:	*KAUF-TIPP DER WOCHE* *DIENSTAG 3 APRIL!* *DIE RALLYE IST GESTARTET!* *Firma: HUMET-PBC NA (L9Z.F)* *4-Tag Prognose: 0.50-0.90* *Letzter Preis: 0.06 (+62%)* *Kurzel : L9Z* *WKN: A0MMPH* *ISIN: US4454081070* *Borsen: Frankfurt* *KAUFEN! L9Z ESGESCHAFT FIN UNTER PARI!* *800%+ GEWINNE WERDEN AN 4 TAGEN!* _____ *ANLEGER UHR ***L9Z.F**** *DIE RALLYE IST GESTARTET!* *UHR AN DIENSTAG MONTAG 2 APRIL!* *Firma: HUMET-PBC NA (L9Z.F)* *5-Tag Prognose: 0.25-0.90* *Letzter Preis: 0.04* *Kürzel : L9Z* *WKN: A0MMPH* *ISIN: US4454081070* *Börsen: Frankfurt* *KAUFEN KAUFEN KAUFEN!* *L9Z ESGESCHAFT FIN UNTER PARI!* *600% Gewinne werden an 5 Tagen!! ÜBERRASCHEN!*

A.4 Example Kabel New Media AG

Company:	Kabel New Media AG
Date of first message:	March 14, 2007
Further occurrences:	March 16, 2007 and March 21, 2007
Sources:	• http://www.dc-campus.net/showthread.php?t=2402 • http://www.virenguard.de/blog/der-aktien-spam-geht-weiter/ • http://www.tradingideas.de/2007/03/21/kabel-new-media-knw-wkn-622950/
ISIN:	DE0006229503
Type:	E-mail
Tout Message:	*Die aktuelle Kursrakete: Kabel New Media AG* *Sensationeller Kursanstieg erwartet!* *Sehr geehrte Damen und Herren,* *folgende Aktien sollten Sie sich in Ihre Depot legen:* *Kabel New Media AG* *Kurs: 5,9 Cent* *7-Tage-Ziel: 22 Cent* *8-Wochen-Ziel: 2,10 Euro* *WKN: 622950* *ISIN: DE0006229503* *Bewertung: Kaufen* *Das geballte Wissen unseres Chartexperten-Teams ist Ihr Nutzen!* *Herzlichst, Ihr* *[NAME]* *Redakteur*

A.5 Example EQUIPMENT & SYS ENGR

Company:	EQUIPMENT & SYS ENGR
Date of first message:	December 1, 2006
Further occurrences:	none
Sources:	• https://www.antispam-ev.de/forum/showthread.php?13581-Stock-Spammer-drehen-durch-APWL-Advanced-Powerline-Technologies&highlight=pennystocks/
ISIN:	US29445M1036 (not in original tout message)
Type:	E-mail
Tout Message:	*Alert! Watch this one Rise!* *Equipment & Systems Engineering, Inc. (EQSE)* *Sector: Environmental Engineering* *Rating: VERY Bullish* *Current Price: $0.062* *Projected: $0.20* *This is THE pick for the fourth quarter. Environmental stocks are getting incredible exposure and taking off as governments and companies realize they need to start investing NOW. EQSE is involved in high tech solutions for both the problems we face today and those of the future.* *Search your favorite financial information site and become a believer. This is HOT!* *An earth-shattering release is expected out of the company any day. With all of EQSE's governmental contacts we are expecting a major contract announcement. This issue is VERY tightly held and the release is going to push it up rapidly. Don't delay. It's not going to stop till we see 20 cents!*

Appendix B: Additional Descriptive Information about the Sample

B.1 Pump-and-Dump Schemes

This section provides more detailed information on the pump and dump campaigns in our sample. Panel A of Figure B1 shows that promoters disseminate tout campaigns via a variety of different communications. E-mail and newsletter, which provide stock recommendations to subscribers, are among the two most common means of distribution. They are used by 37% and 32% of all campaigns, respectively. About 31% of campaigns rely on the telephone as their communication channel. The relatively high percentage of phone campaigns is notable considering the higher costs and lower reach of such campaigns. About a fifth of all campaigns, or 18%, use multiple distribution forms with two channels being common. The two most common combinations are e-mail & phone and e-mail & newsletter. Only a very small number of campaigns (<2%) employ more than two channels.

We are able to find data on the industry, location of the tout venue, and the company's official headquarters for 468 out of 470 touts. As shown in Panel B of Figure B1, the touted stocks are traded on venues from 9 different countries, with Germany and the United States dominating the sample with 70% and 21%, respectively. The location of tout firms' headquarters is more diverse, comprising 12 countries. Although Germany and the United States are again the most frequent locations, there is considerably more heterogeneity in the official headquarter location, with Germany, the United States, and the Canada representing 30%, 25%, and 23%, respectively (Figure B1, Panel C).

We also find that touted firms are purported to be operating in a diverse set of industries (Figure B1, Panel D). Tout stocks are most commonly in Financial Services (26%), but mining, software, and oil & gas companies are also common. However, these designated industries may be deceptive in that some touted firms are shell companies and/or lack substantive operations.

For 397 out of 470 pump-and-dump schemes, we are able to obtain full market data from Datastream over the 60-day period preceding the tout campaign. We report information on this data in Table B1. Touted stocks have an average (median) stock price of €3.06 (€0.69) and an average (median) market capitalization of €67 million (€11.10 million). Thus, tout stocks are typically penny stocks or small cap firms. Additionally, more than half of the stocks exhibit positive returns immediately prior to the start of the tout campaign. This phenomenon likely occurs because perpetrators frequently engage in wash trades among themselves before the tout, creating an illusion of market liquidity and signaling positive price momentum.

B.2 Comparison between BaFin-Provided and Hand-Collected Schemes

In this section, we undertake a descriptive comparison between the combined (or full) sample and the subsample comprising only schemes that BaFin identified and provided to us. First, we analyze participation statistics across both sample sets. In Panel A of Table B2, we duplicate the data presented in Panel A of Table 1 to facilitate a direct comparison with the subset derived from the 263 schemes identified by BaFin. Although the schemes flagged by BaFin have a slightly lower average number of investors per traded tout than the overall sample (73.7 versus 77.72), the overall distribution across both samples is quite comparable. Applying a t-test to gauge the disparity in investor participation, we find that the difference is not statistically significant at conventional thresholds (also consistent with Column 2 of Table 1).

Second, we turn our focus to the key performance indicators of investors in both groups of touts. In this regard, Panel B of Table B3 replicates the data from Panel A of Table 2, enabling a comparison with the BaFin-only statistics. Here too, the descriptive statistics of the BaFin-only sample are largely aligned. Average returns are somewhat more positive in the BaFin sample, but investors tend to invest more money in these touts. Thus, in total, investors have higher average losses in BaFin-sample touts relative to the combined sample (-€859 versus -€770). A similar

pattern emerges for trades aggregated at the tout level in Panel C of Table B3.

Taken together, the analysis suggests that the BaFin-provided and the hand-collected schemes are quite similar in terms of participation and investor performance. This comparison validates the decision to combine both samples in the main analysis.

B.3 Investor Sample

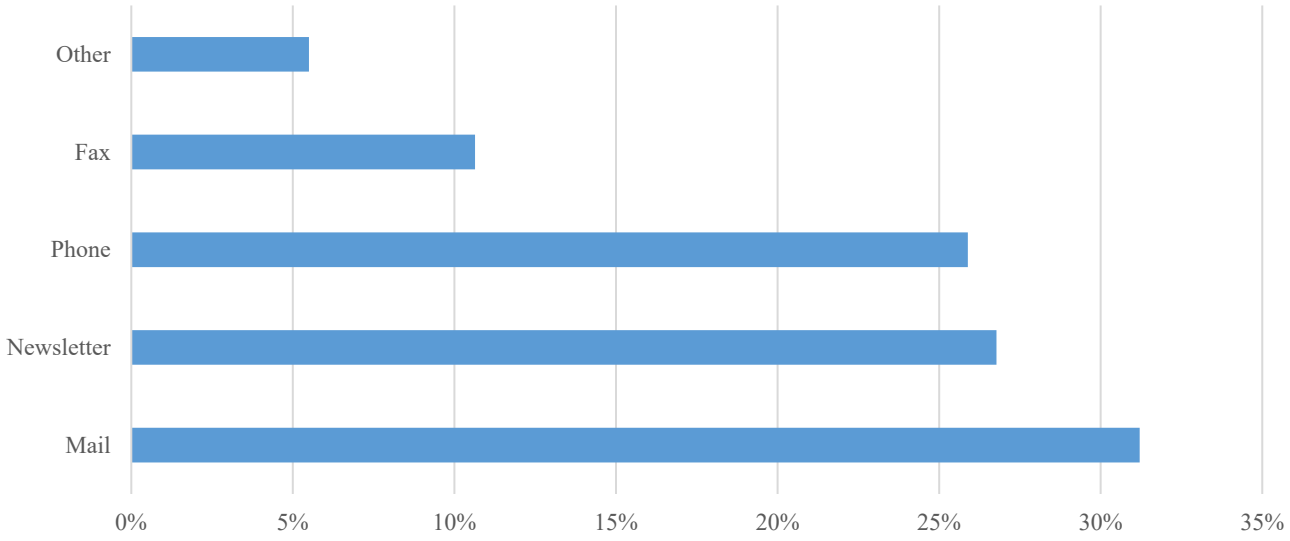
This section provides additional descriptive statistics on investors in our sample. We obtain individual investor data from a large German online bank that operates in all 16 states of the country. Out of the bank's more than half-million clients, we obtain a random sample of 113,000 investors. In Figure B2, we compare these 113,000 sample investors to investors from other studies (Barber and Odean 2001; Dorn and Huberman 2005; Calvet et al. 2007). We find that our sample is largely comparable to others in terms of personal, portfolio and trading characteristics. This comparison also confirms that our sample contains typical online brokerage clients.

For our analyses, we focus on tout investors and (matched) active control investors. Since these investors traded at least one stock during the 60-day pump period, they are naturally more active relative to all customers from our online bank. Table B3 indicates that the 'typical tout investor' is a 46-year-old male living in the suburbs that is married and has a high self-assessed risk tolerance for his investments. The average tout investor has approximately €68,600 in their account, most of which is invested in equities. In fact, a large fraction of their entire portfolio (28%) is comprised of penny stocks (defined as having a price below €5), which often have lottery-like return characteristics (Kumar 2009). Interestingly, we find that control investors exhibit similar personal characteristics (i.e., age, gender, married), but that their portfolios are significantly different. Specifically, non-tout investors trade less frequently than tout investors and hold a smaller (larger) fraction of their portfolio in penny (blue-chip) stocks. This descriptive evidence suggests that portfolios and trading behavior reveal more than personal characteristics.

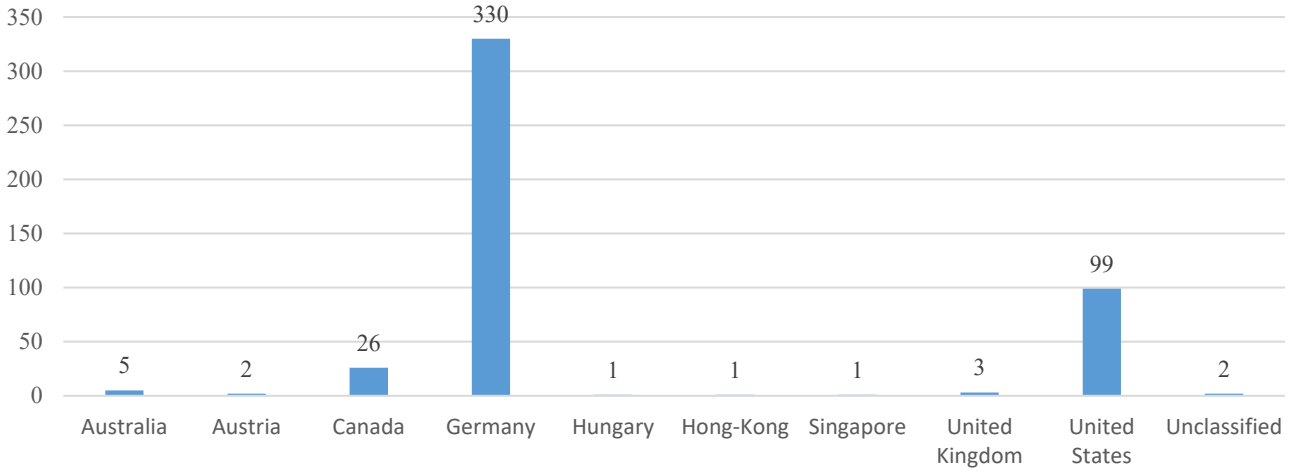
Figure B1: Descriptive Statistics for the Pump-and-Dump Schemes

This figure provides descriptive statistics for the 470 touts in our sample. Panel A describes the distribution channel or tout medium. The total sum is larger than 100% (120%) since a single tout can have more than one distribution channel. Panel B and Panel C show the country of the touted firm by its primary trading venue and the location of its headquarters, respectively, as described by Datastream. Panel D shows the industry of each tout at the time of the pump-and-dump as collected from Datastream.

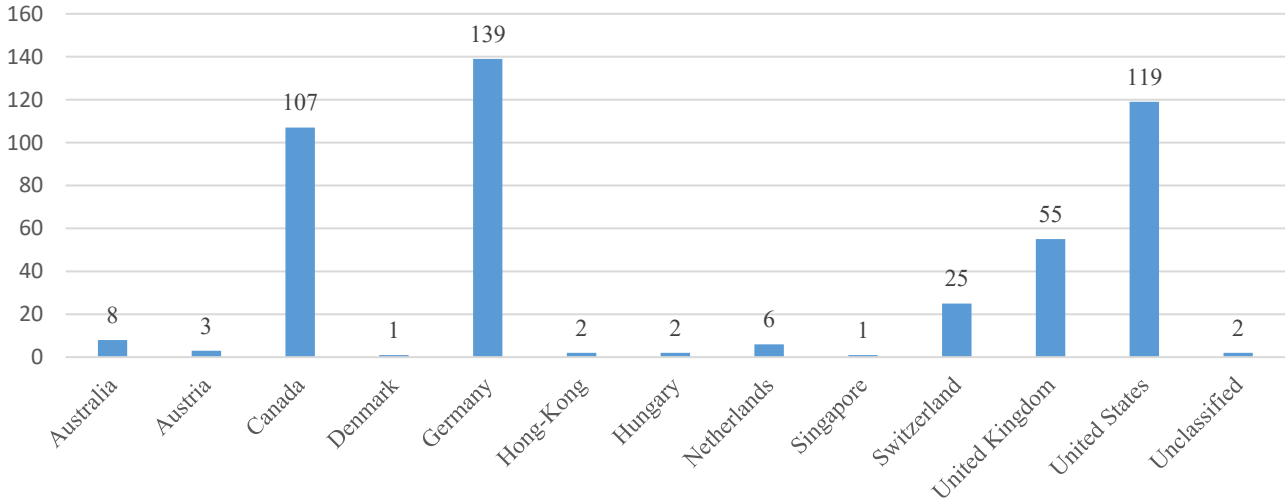
Panel A: Distribution Channel of Touts



Panel B: Country of Tout Trading Venue



Panel C: Alleged Tout Headquarter Locations



Panel D: Alleged Tout Industries

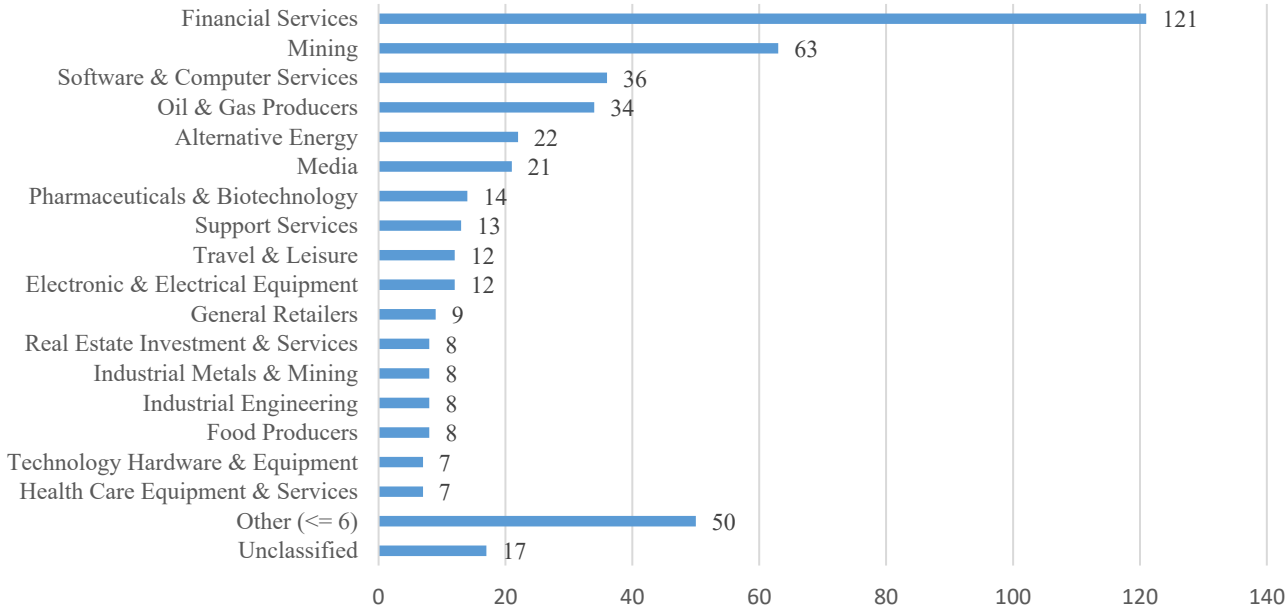
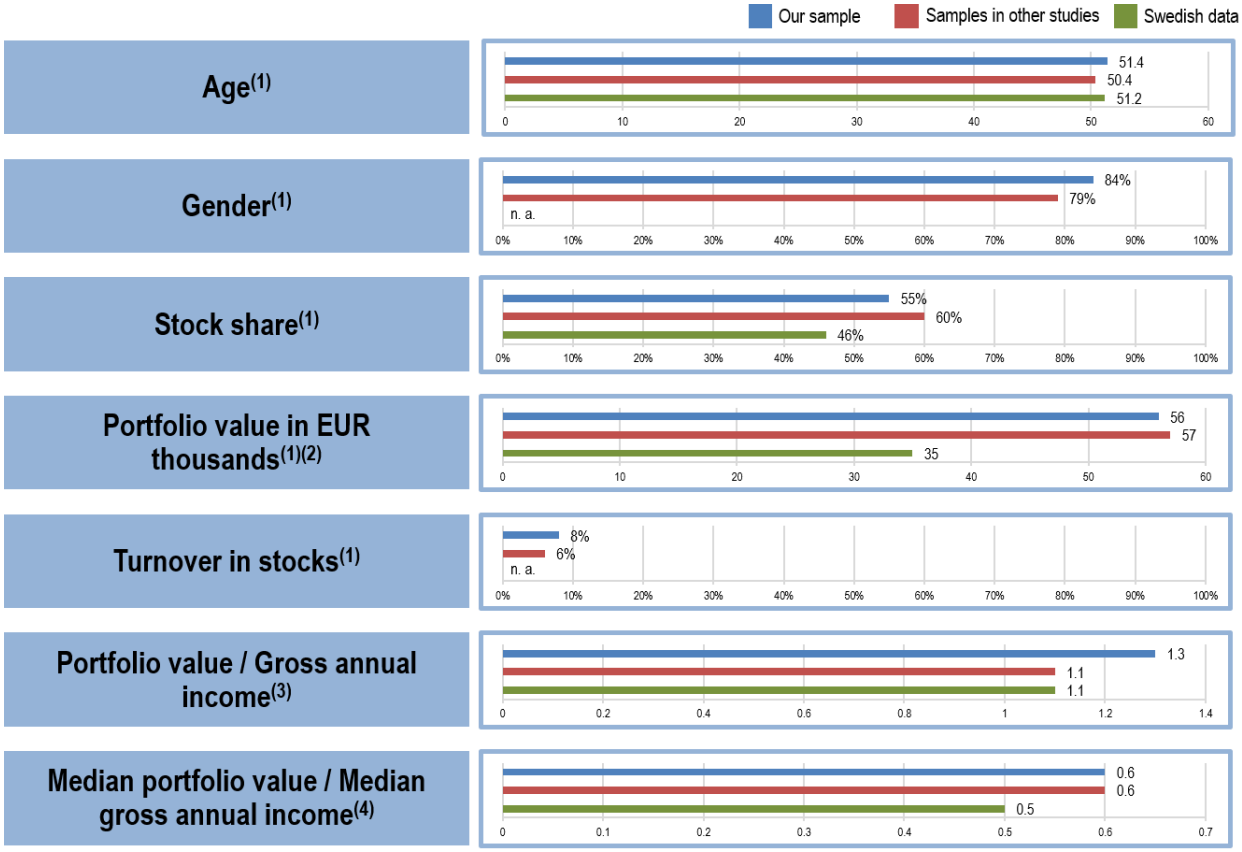


Figure B2: Descriptive Comparisons of Investor Sample with Other Studies

This figure compares our random sample of 113,000 investors from a large German online bank to investors from other studies. The indicated comparison sources are Barber and Odean (2001), Dorn and Huberman (2005) and Calvet et al. (2007).



Sources: (1) Barber and Odean (*QJE*, 2001); (2) $47,000 (portfolio value) / 60% (stock share) * 0.72 (exchange rate); (3) German Federal Bureau of Statistics 2008; (4) Dorn and Huberman (*RoF*, 2005); (5) Calvet, Campbell and Sodini (*JPE*, 2007)

Table B1: Descriptive Statistics on Tout Stocks

This table provides descriptive statistics on tout stocks' average share price, market value (in millions) and pre-tout returns in the 60 days period before the beginning of the tout. Data is reported on the 397 touts for which we have full Datastream coverage before the beginning of the tout.

	N	*Mean*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
Share Price	397	3.06	20.23	0.05	0.23	0.69	1.80	3.33
Market Value	397	67.00	316.4	0.54	2.53	11.10	38.10	92.96
Pre-Tout Return	397	0.15	0.81	-0.47	-0.12	0.03	0.33	0.83

Table B2: Comparison between BaFin and Hand-Collected Schemes

Panel A: Trades in Pump-and-Dump Schemes

	N	*Mean*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
Full Sample								
# purchases per tout during pump phase	385	77.72	199	2	5	18	61	158
BaFin Sample								
# purchases per tout during pump phase	217	73.37	218	1	4	14	44	141

Panel B: Investor Performance at the Trade Level

	N	*Mean (per Trade)*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
Full Sample								
Volume of investments (# shares)	29,922	6,138	38,017	200	500	1,400	4,000	10,000
Size of Investment (Euros)	29,922	4,026	16,234	443	944	1,915	4,000	8,250
Percent Return (raw)	29,922	-0.25	0.50	-0.84	-0.61	-0.22	0.02	0.20
Percent Return (market adjusted)	29,922	-0.28	0.52	-0.90	-0.63	-0.24	0.02	0.18
Gross gain/loss (Euros)	29,922	-770	5,572	-2,425	-985	-266	44	462
BaFin Sample								
Volume of investments (# shares)	15,921	5,590	40,065	190	500	1,000	3,500	10,000
Size of Investment (Euros)	15,921	4,747	21,487	468	984	2,034	4,556	9,740
Percent Return (raw)	15,921	-0.22	0.57	-0.88	-0.63	-0.19	0.05	0.26
Percent Return (market adjusted)	15,921	-0.25	0.58	-0.92	-0.67	-0.20	0.04	0.24
Gross gain/loss (Euros)	15,921	-859	7,413	-2,851	-1,084	-245	96	658

Panel C: Investor Performance at the Tout Level

	N	*Mean (per Tout)*	*SD*	*P10*	*P25*	*P50*	*P75*	*P90*
Full Sample								
Volume of investments (# shares)	18,680	9,832	99,995	250	700	2,000	5,000	15,000
Size of Investment in Tout (Euros)	18,680	6,449	26,740	476	1,002	2,200	5,130	11,966
Percent Return (raw, value-weight)	18,680	-0.28	0.48	-0.85	-0.64	-0.27	-0.01	0.15
Percent Return (market, value-weight)	18,680	-0.32	0.50	-0.91	-0.67	-0.29	-0.02	0.13
Gross gain/loss (Euros)	18,680	-1,234	7,440	-3,462	-1,376	-399	-10	437
BaFin Sample								
Volume of investments (# shares)	9,304	9,566	104,288	200	550	1,600	5,000	14,000
Size of Investment in Tout (Euros)	9,304	8,123	34,763	500	1,070	2,500	6,197	15,100
Percent Return (raw, value-weight)	9,304	-0.26	0.57	-0.89	-0.68	-0.25	0.02	0.22
Percent Return (market, value-weight)	9,304	-0.30	0.58	-0.94	-0.71	-0.27	0.01	0.19
Gross gain/loss (Euros)	9,304	-1,470	10,147	-4,269	-1,610	-405	36	665

Table B3: Descriptive Comparisons of Tout and Non-Tout Investors

This table compares the average characteristics of tout investors at the point of investing in their first tout (n = 8,584) relative to active non-tout (or control) investors. The latter are randomly drawn from the sample of all investors in the month of a tout, have never invested in a tout before, and are required to have purchased a non-touted stock during the pump period (n = 52,171). See notes of Table 3 for the variable definitions. For categorical variables, p-values are based on chi-squared tests (t-tests otherwise).

	Tout Investor	*Active Non-Tout Investor*	*p-value*
Account Wealth (Euros)	68,592	84,238	< 0.01
Total Value Stocks (Euros)	38,766	39,005	0.88
Penny Stock Share	27.52%	9.49%	< 0.01
Blue Chip Share	16.49%	30.62%	< 0.01
Size of Trade (Euros)	3,797	6,642	< 0.01
Number of Purchases (prior year)	55.42	21.15	< 0.01
Age	45.93	44.55	< 0.01
Male?	89.39%	85.95%	< 0.01
Married?	60.42%	58.87%	0.01
Retired?	17.11%	14.73%	< 0.01
Self-assigned Risk Class (out of 5)	3.98	3.51	< 0.01
City Resident?	50.04%	56.81%	< 0.01
Maximum Number of Observations	8,584	52,171	

Appendix C: Matching Tout and Control Stocks based on Price Path

To ascertain that the investor response in our sample is due to the tout itself, we match touted stocks to a control group of stocks with a similar price path using coarsened-exact matching (CEM). We aim to obtain a set of control stocks that exhibit a similar price path as the touted stocks prior to and even in the early phases of the campaigns. The idea is to differentiate with stocks that have tout-like price momentum from stocks that are actually being touted.

Our matching procedure comprises three steps. First, we identify the country of origin for each touted stock by relying on the first two digits of its ISIN. We then collect the *Datastream* universe of all non-touted stocks with the same first two digits of the ISIN and that are active at the same time as the touted stock in the 100-days before the touted stock's event date.[3] Second, we retain only those control stocks that have a similar initial *price level* by matching on five different price strata (0, 0.1]; (0.1, 1]; (1, 5]; (5, 10] and (10; 25] € at the stock's initial date in the pre-period.[4] We match on initial prices to ensure that both tout and control stocks have similar price levels (e.g., lottery stock features). Matching on returns only would potentially yield a very different set of control firms (e.g., matching a penny stock trading for a few cents to a control stock with a more conventional share price of €20). Essentially, the first two steps ensure that we match each touted stock in calendar time to a similar type of stock in the same country. By matching on country and time, we hold the market environment constant.

In the final step, we further restrict the set of eligible control stocks based on their returns to ensure that the control stocks have price run-ups that match those of the touted stocks in the

[3] Specifically, we determine whether a stock is active at four different dates before the beginning of the pump-and-period (at t = -100, t = -75, t= -50, t=-25) by checking whether price data for the stock is available in *Datastream* at the particular date. We require that price data for control stocks becomes available around the same time as for the touted stock. For example, if a touted stock only becomes active between the [-75,-50] time period, we require that the control stocks only becomes active during the same time frame.

[4] We exclude stocks with an initial price level above €25. Only three tout stocks fall into this (25, ∞)-category and including these stocks with extreme price levels would have an extreme influence on the average price levels (and hence price paths based on raw prices would be hardly interpretable).

beginning of the tout campaigns. Specifically, we employ three different approaches: In the first approach (I), we match on return quartiles over the two 25 days period preceding the beginning of the tout (i.e., on return quartiles over the [-50,-25] and [-25,0] periods). This matching approach is the least demanding approach and corresponds to Figure 4 in the paper. The second approach (II) additionally requires that touted and matched control stocks are within the same return quartile for the 25-day period after beginning of the campaign (i.e., stocks are also matched on return quartiles over the [0, 25] time period). In the third approach (III), we follow approach (II) and then add the criterion that both touted and control stocks have similar trading volume over the [-100, 0] pre-period, coarsened by quartiles. This approach ensures that both type of shares have similar liquidity before the beginning of the tout campaign. Depending on the exact matching procedure, we are able to match 317 (I), 264 (II) or 193 (III) out of 470 tout cases.[5] Table C1 provides statistics on returns for touted and matched control stocks. In general, all matching approaches lead to similar return patterns for touted and control stocks immediately before and around the event date [-50, 25]. Approaches (II) and (III), shown in Panels B and C, exhibit even more similar return patterns directly around the tout date (i.e., during the [-25, +25]-day time period). Panel A of Figure 4, Figure C1 and Figure C2 show the respective price paths for each of the matching procedures. For logged prices, we use log(1 + Price) as a significant number of stocks has prices below €1, leading to a heavily skewed distribution otherwise.

After matching, we analyze the investor response around the tout and pseudo-tout dates within our brokerage sample.[6] We use four different proxies to measure the investor response, comparing

[5] While our sample contains 470 touts, we have the relevant non-missing *Datastream* data around the tout campaign for 383 cases only (i.e., we can match up to 317 out of 373 cases, or 85%). Our inability to match some tout stocks in approach (II) and (III) reflects the more stringent matching requirements. We view the investor response test as a way to ascertain that investors indeed respond to the tout campaign and hence prefer to have tightly matched stocks, rather than a larger sample.

[6] Since we often have multiple matches per touted stock, we ensure that all control stocks have in aggregate the same weight as the respective tout stock (consistent with CEM weights).

treated and control stocks in event time. All measures are based on the same 113,000 investor sample of our large German online bank (see Section 3.2 for details): (i) the total number of distinct touted or control stocks traded per day, (ii) the average number of (new) investors per stock and per day, (iii) the average number of purchases per stock and per day and (iv) the average Euro investment per stock and per day. The respective investor response proxy is plotted in Panel B of Figure 4 (I), Figure C1 (II) and Figure C2 (III), for each of the three matching approaches.

We find a sharp increase in trading activity in our brokerage sample around the start of the pump-and-dump campaign for touted stocks but not for matched control stocks, despite the fact that the latter exhibit a similar price path before or even in the early phase of the tout campaign. This evidence suggests that investors respond to the campaigns rather than invest coincidentally because they see the price momentum.

Table C1: Returns for Touted and Matched Control Stocks

This table shows average stock returns of touted stocks and a set of matched control stocks over different periods in event time (for a detailed description of our matching procedure see above). We use CEM weights to calculate average returns for matched stocks. The last column contains t-statistics comparing the average returns of touted and (weighted) control stocks over the respective sub-periods. In Panel A, we match on initial price levels (five price strata) and on return quartiles over the [-50, -25] and [-25, 0] time periods before the event date. In Panel B, we additionally match on return quartiles over the [0, 25] time period after the event date. In Panel C, we add the average Euro trading volume (four EUR trading volume quartiles) over the entire pre-event period [-100, 0] as another matching variable. *, **, and *** indicate significance (two-sided) at the 10%, 5%, and 1% levels, respectively

Panel A: Matching on initial price levels and pre-event returns

	Touted Stock Returns	*Matched Stock Returns*	*t-statistic*
t ϵ [-100, -75]	-0.014	-0.025	0.359
t ϵ [-75, -50]	0.033 *	-0.023	1.861
t ϵ [-50, -25]	0.038	0.022	0.460
t ϵ [-25, 0]	0.122	0.095	0.870
t ϵ [0, 25]	-0.002	-0.042	1.121
t ϵ [25, 50]	-0.122 ***	-0.018	-3.762
Number of stocks	317	23,334	

Panel B: Matching on initial price levels, pre-event returns and post-event returns

	Touted Stock Returns	*Matched Stock Returns*	*t-statistic*
t ϵ [-100, -75]	-0.029	-0.029	-0.005
t ϵ [-75, -50]	0.011	-0.017	0.802
t ϵ [-50, -25]	0.031	0.023	0.202
t ϵ [-25, 0]	0.106	0.079	0.739
t ϵ [0, 25]	-0.027	-0.045	0.411
t ϵ [25, 50]	-0.125 ***	-0.014	-3.739
Number of stocks	264	9,142	

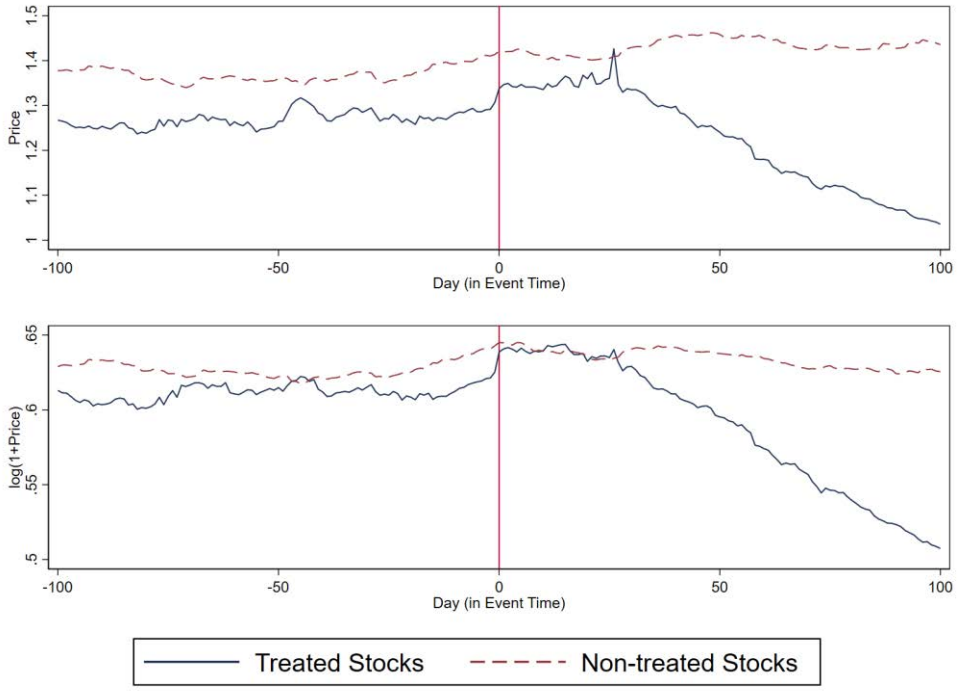
Panel C: Matching on initial price levels, pre-event returns, post-event returns and pre-event trading volume

	Touted Stock Returns	*Matched Stock Returns*	*t-statistic*
t ϵ [-100, -75]	-0.052	-0.022	-0.792
t ϵ [-75, -50]	0.004	0.010	-0.138
t ϵ [-50, -25]	0.031	0.001	0.596
t ϵ [-25, 0]	0.080	0.045	0.814
t ϵ [0, 25]	-0.022	-0.022	0.019
t ϵ [25, 50]	-0.124 ***	-0.027	-2.698
Number of stocks	193	4,810	

Figure C1: Alternative CEM Matching Procedure (Approach II)

See notes to Figure 4 and Panel B of Table C1 for details.

Panel A: Price Path of Touted and Matched Stocks



Panel B: Response by Investors in Brokerage Sample

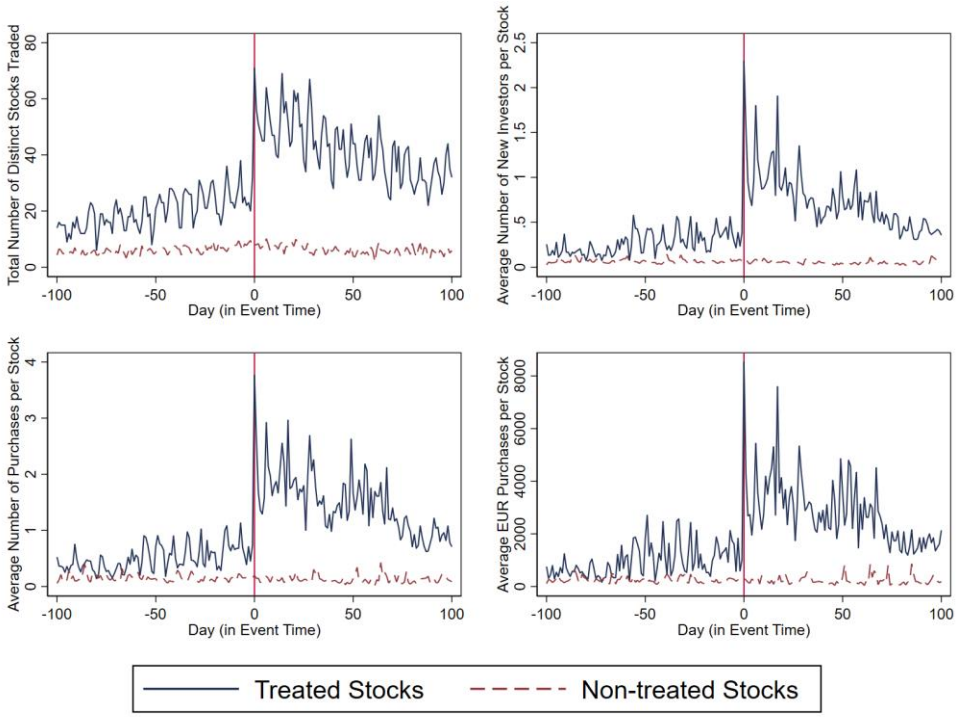
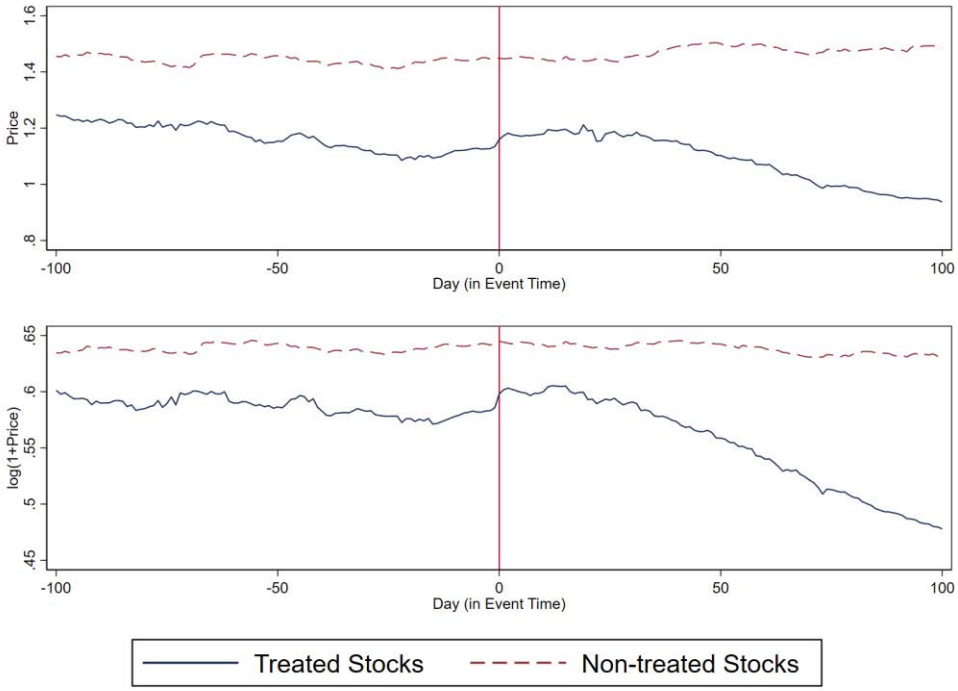


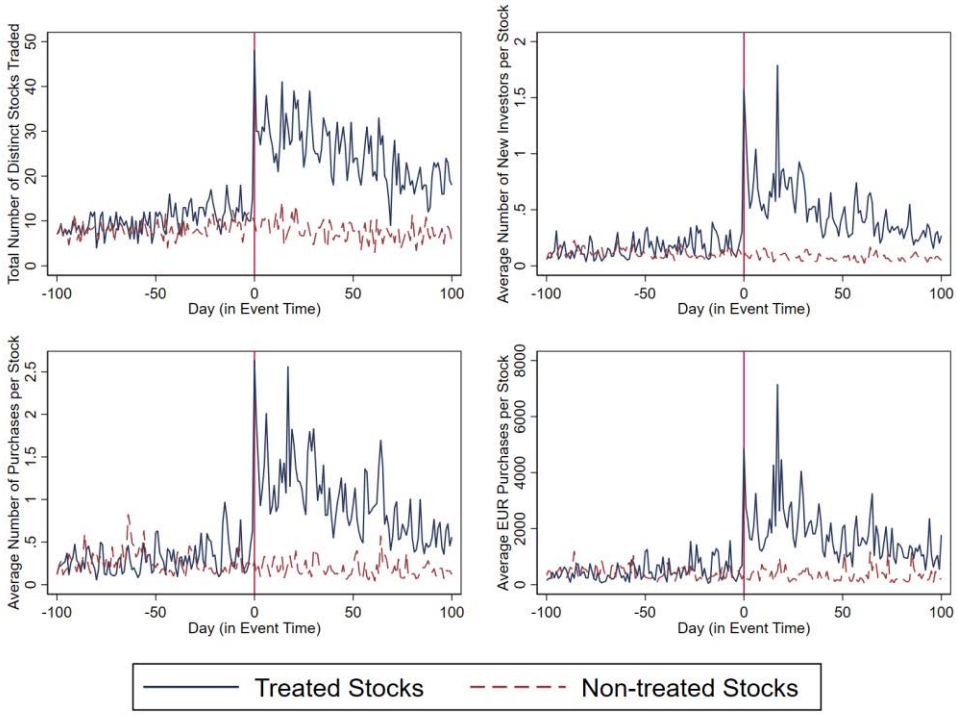
Figure C2: Alternative CEM Matching Procedure (Approach III)

See notes to Figure 4 and Panel C of Table C1 for details.

Panel A: Price Path of Touted and Matched Stocks



Panel B: Response by Investors in Brokerage Sample



Appendix D: Sensitivity Analysis for the Pump-Period Assumption

Throughout the paper, we treat investors within the first 60 days of the tout promotion as pump-and-dump investors. This 60-day assumption is supported by the elevated trading pattern in the aftermath of the promotion (e.g., see Figure 3). We also show that the vast majority of purchases within 60 days from the start of the tout campaigns are indeed investor responses to the schemes and in that sense constitute participation. Nevertheless, we gauge the sensitivity of our results with respect to the 60-day window. Towards this end, we provide the main descriptive statistics for four alternative pump-period assumptions in Table D1.

Column (2) of Table D1 corresponds to our main sample and replicates the key results from Table 1 and Table 2. Using this assumption, we have 385 traded touts with 77.72 purchases per tout (see also Table 1). These 29,922 tout trades lead to 18,680 distinct tout observations from 8,584 investors, who lose on average -€1,234 or -28% per tout investment (see also Table 2). Unsurprisingly, for a shorter 30-day window, the absolute numbers are somewhat smaller. However, the overall participation (e.g., 350 traded touts with 50.74 purchases per tout) and, in particular, average losses per tout (-26%) are still sizeable and quite comparable to the statistics we obtain using the 60-day window. For longer windows, average losses (-29%) remain consistent with overall participation further increasing (e.g., 399 traded touts with 95.40 purchases per tout for the 90-day window). Thus, the specific choice of a 60-day window does not appear to have a major influence on our results.

Table D1: Participation and Performance for Various Pump-Period Assumptions

This table shows the sensitivity of our key descriptive results with respect to alternative pump period assumptions. Column 2 (60 Days) corresponds to our main assumption in and replicates the main results from Table 1 and Table 2. *Percent Return (raw, value-weight)* and *Gross gain/loss (Euros)* are based on the Investor Performance at the Tout Level. Column (1) shows the statistics for a shorter window and Column (3) to (5) for longer windows.

	30 Days	60 Days	90 Days	120 Days	150 Days
Table 1					
Traded Touts	350	385	399	405	405
Number of Purchases	50.74	77.72	95.40	111.04	125.14
Table 2					
# Tout Trades	17,758	29,922	38,063	44,970	50,680
# Tout Observations	13,089	18,680	22,100	25,079	27,179
# Tout Investors	6,736	8,584	9,695	10,398	10,852
Percent Return (raw, value-weight)	-0.26	-0.28	-0.29	-0.29	-0.29
Gross gain/loss (Euros)	-987	-1,234	-1,316	-1,250	-1,303