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Optimism gone bad? The persistent effects of traumatic experiences on investment decisions

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Chi Hyun Kim

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Optimism gone bad?

The persistent effects of traumatic experiences on investment decisions*

Chi Hyun Kim[†]

June 9, 2021

Abstract

Do memories of highly emotional stock market crashes permanently affect the investment decisions of households? The Initial Public Offerings of Deutsche Telekom during 1996-2000 provide an optimal base to address this question, as it is known for its emotional character and is reputedly “the last time Germans invested in stocks.” Using Socio-Economic Panel (SOEP) household survey data, I show that having experienced this event leads to persistently lower stock market participation in the future. In addition, this effect is greater for households that had directly invested in Telekom shares, those being more likely to have high emotional experiences. Finally, I also show that such traumatic experiences on investment decisions have intergenerational consequences, significantly affecting how the next generation invests in the financial market.

Keywords: Household finance, stock market participation, financial crises

JEL Classification: D14, G01, G11, E21

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1 Introduction

Although stock investments yield high equity premia, most households do not invest in stocks – a phenomenon known as the *stock market participation puzzle* (Haliassos and Bertaut, 1995; Guiso et al., 2003). Much effort has been put forth to understand the drivers of such behavior, as inefficient investment decisions by households can have negative consequences for their long-term financial well-being. One important finding is that personal experiences are important for investment decisions (Choi et al., 2009; Malmendier and Nagel, 2011). In particular, negative experiences, such as stock market crashes, play a crucial role: after a crash, households are very likely to avoid the stock market (Bucher-Koenen and Ziegelmeyer, 2014; Guiso et al., 2018). What is not yet investigated is whether households recover from such negative events, as they gather new positive experiences while memories of the past crash fade away, or whether they permanently stay away from the stock market.

In this paper, I address these questions by examining a unique stock market crash event in Germany that has the reputation of being “the last time when German households invested in stocks” (Süddeutsche Zeitung, 2014). This event is the Initial Public Offerings (IPOs) of Deutsche Telekom, the German telecommunication giant, during 1996-2000 (which I label as the “Telekom event” throughout the paper). A unique feature of this event is its high media exposure, including an unprecedented advertisement campaign of Deutsche Telekom, which resulted in exceptionally high participation rate of retail investors. However, this high popularity had a downside, as the crash of the Telekom shares over the 2000 to 2002 period provoked strong negative emotions among the German public. I argue that this high emotional turbulence increased the salience among German households (in combination with the negative emotion that was generated along the way) such that German households are still reluctant to invest in stocks; a phenomenon called *emotional tagging* (Laudenbach et al., 2019a).

Using Socio-Economic Panel (SOEP) household survey data, I empirically examine whether the Telekom event persistently affects the stock market investment behavior of German households today. Within a three-part analysis, I investigate the impact of direct experience, the effect of emotional tagging, and the possibility of an intergenerational transfer. To investigate the first aspect, I assume that household heads who were older than 20 during the crash in 2000 are old enough to acknowledge the Telekom event and directly experienced it. After controlling for all relevant socio-economic characteristics, the analysis shows that these households are not only significantly less likely to participate in the stock market in 2016, but they also enter and exit the stock market less than those household heads who were too young to directly experience the event. This finding is striking, as stock market participation of the former group is much

higher in levels than the latter.

Also, I examine whether the degree of emotional attachment amplifies the effect of such experiences. Households that had directly invested in Telekom shares (and resulted in real money losses after the crash) have higher emotional attachment to this event and, thus, are less likely to invest in stocks than households that only experienced the Telekom event through the media. As exact information on the Telekom investment of households is not available in the data set, I develop a proxy for being a Telekom investor. Additionally, I construct a control group, which I identify with matching methods, comprising households that have similar characteristics as Telekom investors, but did not enter the stock market during the Telekom event. My results confirm the importance of such emotional attachment on long-term investment decisions. Finally, my analysis shows that emotionally-driven experiences can be passed on to the next generation. I confirm this by analyzing investment decisions of children of Telekom investors.

Literature review According to the seminal paper of [Malmendier and Nagel \(2011\)](#), households anticipate their life-time experiences of asset returns when they make investment decisions today. One key feature of their analysis is that households have a *fading memory*: far realized returns have less impact on investment decisions than more current ones. However, other studies prove how certain memories have the potential to stick in our memories, regardless of how far this event lies in the past. [Ampudia and Ehrmann \(2017\)](#), for instance, show that experiences of financial crises persistently affect investment decisions of euro area households; [Kozlowski et al. \(2019\)](#) show how crises can permanently shift the way how economic agents assess risk in the future. Within a similar context, [Laudenbach et al. \(2019b\)](#) confirm long-lasting effects of experiences with communism on risk-taking behavior, even after people live in a capitalistic system.

A study by [Laudenbach et al. \(2019a\)](#) proposes emotional tagging to explain why certain experiences tend to stick to our memories, thereby building a base for our economic decision makings. The mechanism that explains this phenomenon is based on the theory of memory formation in neuroscience, which shows how emotions can help the brain to memorize an event or experience ([Talarico et al., 2004](#); [LaBar and Cabeza, 2006](#)). If we experience a strong emotional arousal during an event (either positive or negative), then we are likely to remember this emotion when we are exposed to a similar situation in the future. This emotion, in turn, influences the way we respond to the future event.

In the stock market, emotions play a key role: many studies confirm how human instincts and emotions that seemingly affect human behavior in economic decision makings, such as confidence, optimism (pessimism), or trust, can explain a substantial part of the dynamics in the financial

markets (Keynes, 1936; Shiller, 2000; Brunnermeier and Nagel, 2004). Therefore, emotional tagging has the potential to explain how investors behave in the stock market, depending on their previous experiences. My study contributes to this literature by showing how an emotionally-driven stock market event can function as a single “rare disaster” that can lead to persistent low stock market participation of households (Haliassos and Bertaut, 1995; Campbell, 2006; Barro, 2006, 2009; Alan, 2012).

The remainder of this paper is structured as follows. Section 2 introduces the Telekom event and explains why this event is attached with high emotional turbulence. Based on these insights, I derive testable hypotheses. Thereafter, in section 3, I use SOEP household survey data to present descriptive statistics on German households’ stock market investment behavior during 1990 and 2016. Finally, section 4 introduces the empirical framework, identification strategy of the Telekom event, and results. Section 5 concludes.

2 The Telekom event

In this section, I provide a detailed description of the Initial Public Offerings (IPOs) of Deutsche Telekom. First, I introduce the timeline of the rise and fall of the Telekom shares (T-shares) between 1996 and 2002. Then, I discuss the reasons why the Telekom event has the potential to be tagged with high emotions for the German public, even twenty years later. Afterwards, in order to visualize this emotional turbulence, I conduct a sentiment analysis on newspaper articles and analyze its development along with the timeline of the Telekom shares after the crash. Based on these insights, I develop two research hypotheses.

2.1 Timeline of the Telekom event

Telekom’s advertisement spectacle Deutsche Telekom AG, a former entity of the German federal government’s postal administration (Deutsche Bundespost), was privatized in 1995 and made its IPO in November 1996. However, at the beginning of 1996, the company struggled with its very negative reputation amongst the general public due to its new tariff structure and high local call prices (König, 1997). Deutsche Telekom acknowledged that their IPO could only be successful if they manage to re-polish their image. Based on these insights, Deutsche Telekom hired *Dewe Rogerson*, a British financial and corporate communications consultancy, and invested around 200 million Deutsche Mark (around 98 million euro) in an advertising campaign. In particular, the company conducted a very aggressive strategy to capture the attention of potential retail investors from the general public. Their aim was to make the T-shares the “people’s share.” As a result, the IPO of November 1996 was a great success with

around 1.9 million retail investors investing in 285 million Telekom shares.

Three main factors explain the great success of the T-shares. First, Deutsche Telekom did not shy away from directly contacting the public. The company sent personal invitations to all Telekom customers and asked them to register to the Deutsche Telekom’s “Aktien-Informations-Forum” (AIF).¹ The AIF sent company booklets and information sheets for “stock investment for beginners.” Within one month, the number of registrations reached the million threshold and, by November 1996, almost three million people were registered with the AIF. Additionally, Deutsche Telekom offered discounts to retail investors to facilitate the stock market entry of people who had never invested in stocks before. After the first IPO, Deutsche Telekom stayed in close contact with their retail investors by sending them letters, personally written by the director Ron Sommer.

Second, Deutsche Telekom used media presence to improve their brand image. The company placed television commercials to awake positive emotions of the audience: they streamed “High-Tech and High-Touch spots” on television to show off their advanced technical capability and, starting from August 1996, an advertisement for the T-shares, where Manfred Krug – a very popular actor at that time – introduces himself as a stock investor and announces that he will definitely invest in the T-shares.² Further, Deutsche Telekom also utilized newspapers and magazines to attract the attention of the public with information about the operational details of the company. Deutsche Telekom highlighted its “customer-oriented” operation design and great growth potential.

Last, but not least, director Ron Sommer also played a crucial role in gaining public trust. As the new head of the Deutsche Telekom after the 1995 privatization, he represented freshness, innovation, and a successful future for Deutsche Telekom as an up and coming “Global Player” in telecommunications. His progressive investment plans and confidence initiated an optimistic sentiment among retail investors. With confidence, he assured that “the T-shares are secure as an inheritable retirement pension supplement.” Very quickly, Ron Sommer became the face of Telekom shares.

Dotcom bubble crash Following the first IPO in November 1996, the price of T-shares continuously increased, as shown in Figure 1. The company launched two further IPOs in June 1999 and June 2000, where the participation rate of retail investors was remarkably high, with an increasing trend over the three IPOs (see Table 1). However, the steep rise of the Telekom shares did not last long. After peaking at 103.90 Euro in March 2000, both global factors and

¹Translated: Stock-Information-Forum.

²Deutsche Telekom also increased its media presence by investing in sports sponsorships (cycling, soccer) and tech-exhibitions (such as the CeBit-exhibition).

internal company problems led to a very fast crash of the Telekom share prices. In June 2002, Telekom shares were worth only 9 Euro per share.³

Table 1: Allocation of the IPOs of the Telekom shares

	DT1	DT2	DT3
Date	18.11.1996	28.6.1999	19.6.2000
Issue amount (€)	713.7 mio	280.9 mio	200 mio
Retail	43%	54%	70%
Institutions	57%	46%	30%

Note: DT1, DT2, and DT3 present the first, second and third IPO of the Deutsche Telekom, respectively. *Source:* Deutsche Telekom Investor Relations

Figure 1: Price of the Telekom shares



Source: Datastream.

However, the crash of the T-shares was not an individual case, rather it was part of the overall situation in the global stock market. Two major global events happened during this period, one being the Asian financial crisis starting in July 1997 and the other being the Dotcom bubble burst in the early 2000s. While Deutsche Telekom was not severely hit by the Asian financial crisis, the bust of the Dotcom bubble hit the German stock market very hard as a whole. In particular, the market segment “Neuer Markt” (“the new market”) of the German stock market, which was introduced in 1997 with a focus on tech companies, had to deal with serious corrections of their overrated market performances – Deutsche Telekom being part of this market segment.

³Since then, the price of the Telekom shares stayed stable around the 15-20 Euro mark (status as of 2021).

Internal problems Additionally, rumors were spreading more and more with regard to Deutsche Telekom’s balance sheet. It started with an article in *Der Spiegel* in August 1998, which states that Deutsche Telekom over-valued its real estate holdings by anticipating price increases during the real estate boom. Calculations predicted the value adjustment according to this mispricing to be between 3.5 and 4.2 billion Deutsche Mark (Der Spiegel, 1998). After these rumors were confirmed, on July 16, 2002, Ron Sommer was forced to resign from his position as the directorate of Deutsche Telekom, which was a clear signal of the end of the T-shares era. Afterwards, the company made changes in their operational strategy with strict austerity policies.

2.2 Sentiment analysis and hypotheses

Although the entire German stock market suffered a crash during the Dotcom bubble burst, the Telekom event is probably the most prominent event, resulting in extensive media coverage and, consequently, high interest of the German public. The very fact that 2 million retail investors participated in the first IPO (König, 1997) reflects the scale of this event, demonstrating how many people were affected by the crash in 2000. Further, the company’s corruption scandals provoked strong negative emotions among the German public, as German households had high faith in the business model of the former public cooperation.

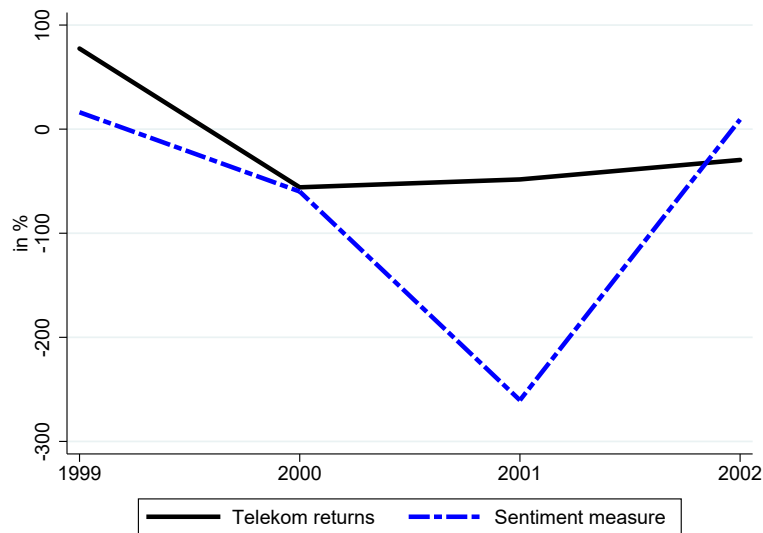
Since the Telekom event was quite prominent in the media, a sentiment analysis of newspaper articles is well suited to visualize the public’s sentiment. I use digitalized newspaper articles of the *Handelsblatt*, which is Germany’s leading financial newspaper. As a first step, I identify all articles between 1998 and 2002 that report information on Telekom shares.⁴ Next, I clean the text to minimize noise that can distort the true sentiment of the content. After the data-cleaning process, I apply a lexicon-based sentiment analysis using a publicly available German-language lexicon source called *SentiWS*. This lexicon lists positive and negative sentiment bearing words weighted within the interval of -1 and 1, with 1 being absolute positive and -1 being absolutely negative. For my purpose, I first calculate the average tone of all newspaper articles in a given year. Then, I calculate the yearly growth rate of this sentiment measure, as I am interested in how sentiment has evolved since the crash.⁵

Figure 2 presents the results. Besides the change in sentiment, I also plot the change in Telekom share prices, which serves as an “objective” benchmark of the evolution of the Telekom event. Right after the crash in 2000, both price and media sentiment experience a steep drop. However, while the drop in prices seem to stabilize thereafter, sentiment continues to drop in

⁴I concentrate on the crash period, as the negative emotions during this period dramatically enhanced the emotional tagging of German households.

⁵Detailed description of the method is provided in Appendix A.

Figure 2: Change in media sentiment vs. price



Source: Own calculations using newspaper articles of the *Handelsblatt*.

an even more substantial manner in 2001. This fits very well with the timeline of the Telekom event as Deutsche Telekom experienced massive criticism due to poor management and corrupt behavior by the executive board, both of which may have worsened the sentiment of the German public. Additionally, the fact that sentiment decreases in a much stronger manner than the price itself further supports the argument that emotional turbulence was high.⁶

Based on these insights, I hypothesize that the Telekom experience is highly attached with emotions that enhanced the emotional tagging of German households.

Hypothesis 1: The Telekom event has persistently affected investment decisions of German households.

After the crash, German households that had invested in Telekom shares ended up filing mass lawsuits against the company (Der Spiegel, 2001).⁷ This implies that active investment in Telekom shares, which led to real money losses for many households, may have triggered stronger emotional turbulence than for households that only experienced the Telekom event through the media. Therefore, as a complementary hypothesis,

⁶As an extension, it would be also interesting to include additional newspapers and even television coverage of Deutsche Telekom, as *Handelsblatt* may be somewhat neutral in their reports compared to other populist media sources like the *Bild newspaper*. Nevertheless, to some degree, this exercise shows the lower bound of media sentiment and including other sources may amplify my results.

⁷Interestingly, they even accused the actor Manfred Krug, who was the main figure of the TV-commercial, for lying to the public. Manfred Krug, even though he had nothing to do with the crash itself, ended up giving an official apology to the public during a newspaper interview several years after the crash, noting that his appearance in the commercial was “the biggest failure of his career” (FAZ, 2007).

Hypothesis 2: Households that had actively invested in Telekom shares have higher emotional attachment to the event and, thus, are less likely to participate in the stock market today than households that did not invest.

3 Descriptive statistics

In this section, I provide descriptive statistics of stock market participation behavior of German households during 1990 and 2016 and connect them with the insights of section 2. To do so, I use Socio-Economic Panel (SOEP) data provided by DIW Berlin. After a description of the data, I present the development of stock ownership between 1990 and 2000, which includes the three IPOs of the Telekom shares. Afterwards, I analyze stock market participation behavior of German households after the Telekom event.

3.1 The Socio-Economic Panel

The SOEP is a nationally representative household survey data that contains not only information on households' socio-economic characteristics, such as family composition, employment, home ownership, and income, but also on their holdings of financial assets. Overall, in each wave, the SOEP provides information on ownership of six financial asset categories of the previous year: saving accounts, home ownership saving contracts ("Bausparvertrag"), life insurance policies, fixed-interest securities (including saving bonds issued by banks, mortgage-backed bonds, and government bonds), stocks held directly or through mutual funds, and ownership (or shares) of non-listed firms.⁸ In addition, the SOEP also provides a wealth module since 2002, where they ask respondents to report their holding amounts in different asset classes. This information is gathered every five years.

The SOEP is the only survey that includes information of German households' investment behavior for the pre-2000 period, when the three IPOs of the Telekom shares took place.⁹ Additionally, the SOEP has a panel dimension that allows me to track households over time. This is very helpful for identifying households during the current waves that were exposed to the Telekom event in the past. Therefore, SOEP data are best suited for my data analysis.

⁸In Appendix B, I summarize asset ownership of German households between 1990 and 2016.

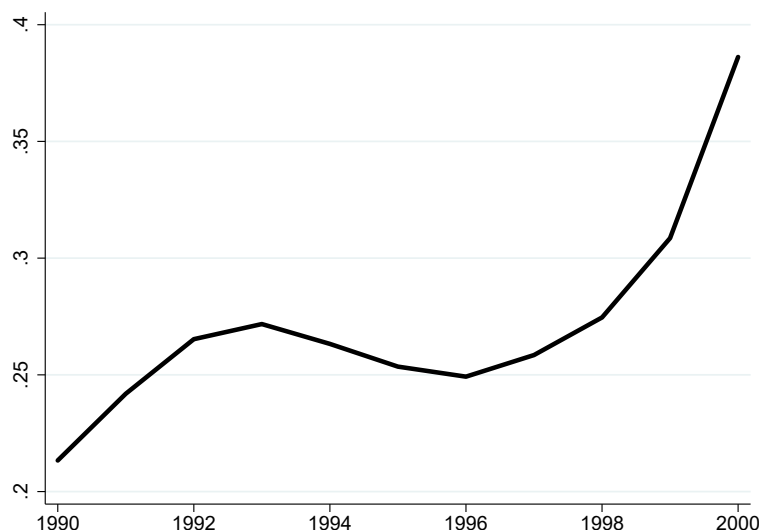
⁹Besides the SOEP, there are two surveys that capture investment behavior of German households. The SAVE study is a cross-sectional study that was initiated by the Munich (formerly Mannheim) Center for the Economics of Aging (MEA) to explicitly analyze investment and saving behavior of German households. This study started in 2001 and was terminated in 2011. The Deutsche Bundesbank also started its own survey, the Panel of Household Finances (PHF), which is conducted every third year since 2011. This survey provides the most detailed information on households' portfolio composition, along with their socio-economic characteristics.

However, despite these advantages, there are also some drawbacks. Before 2001, households were asked to report their ownership in fixed-interest securities (including saving bonds issued by banks, mortgage-backed bonds, and government bonds) together with their stock holdings. Only after 2001 did the survey distinguish between these two asset categories. Nevertheless, ownership of these two asset categories are highly correlated and, thus, can still serve as a reliable proxy for stock ownership.¹⁰

3.2 Stock market participation during the Telekom event

Serving as a proxy for stock ownership, Figure 3 presents the development of security papers ownership of German households between 1990 and 2000.¹¹

Figure 3: Stock market participation rate (proxy): 1990-2000



Source: Own calculations using SOEP data.

On average, 27% of German households reported owning stocks between 1990 and 2000.¹² Interestingly, stock ownership doubled over these ten years. In 1990, the stock ownership rate was 21%; in 1996 it started increasing exponentially, then peaking at 41% in 2000. By comparing summary statistics of stock owners of 1990 and 2000, Table 2 shows that the overall picture of stock investors changed as well. In 2000, stock investors (i) are more likely to be a woman, (ii) are slightly younger, (iii) are more likely to come from the former GDR, and (vi) have lower total family income compared to stock investors in 1990.

To better understand who entered the stock market between 1996 and 2000 (thus having a

¹⁰For the comparison of these ownership of these two asset classes, see Figure 9 in Appendix D.

¹¹Note again that this indicator includes both ownership of stocks and fixed-interest securities, as separate information is not available prior to 2001. Nevertheless, for simplicity I define this proxy as stock ownership.

¹²Note that this indicator includes both direct and indirect holdings of stocks.

Table 2: Summary statistics

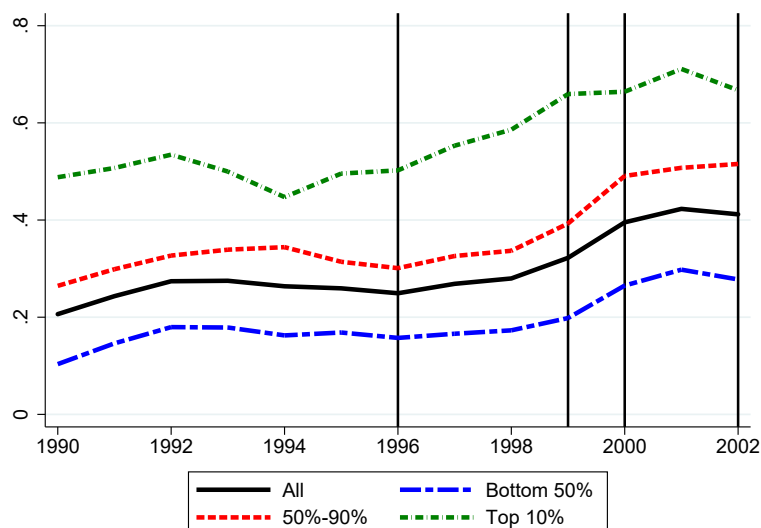
	1990		2000	
	mean	sd	mean	sd
<i>Demographics</i>				
Sex	0.73	0.44	0.68	0.47
Age	46.51	13.53	46.32	12.70
Married	0.65	0.48	0.58	0.49
Number of children	0.48	0.84	0.45	0.81
Household size	2.52	1.23	2.32	1.19
Highschool degree (<i>Abitur</i>)	0.24	0.43	0.29	0.45
University degree	0.26	0.44	0.31	0.46
Employment	0.73	0.44	0.73	0.45
Former FRG/GDR	0.94	0.24	0.82	0.39
Total family income	44295.96	28721.20	43193.14	23967.40
<i>Financial decisions</i>				
Riskl. asset ownership	0.98	0.15	0.97	0.17
Home ownership	0.51	0.50	0.52	0.50
Asset income	2352.86	6559.14	2670.70	8002.18
Risk aversion	4.60	1.86	4.70	1.77
Fin. risk taking	2.80	2.09	2.99	2.06
Observations	1038		3879	

Note: This table shows the summary statistics of German stock owners' socio-economic characteristics in 1990 and 2000. *Source:* Own calculations based on SOEP data.

positive probability of having invested in Telekom shares), I analyze stock market participation of different household groups. As a first step, I distinguish between three income groups: the bottom 50%, 50% to 90%, and the top 10% of the total income distribution. This distinction is useful in understanding whether households with higher income were more likely to invest in Telekom shares, as income positively correlates with household stock market participation. Figure 4 presents the results.

From 1990 to 1995, the development of stock ownership is quite stable for the bottom 90% of the income distribution, while for the top 10%, stock ownership decreased slightly in 1994. Thereafter, stock ownership increases across all income groups, but differently in timing. While households in the top 10% of the income distribution started to increase their ownership in 1994 – before the IPOs of T-shares – stock ownership among the bottom 90% increases after 1999, so rather during the second and third IPOs.

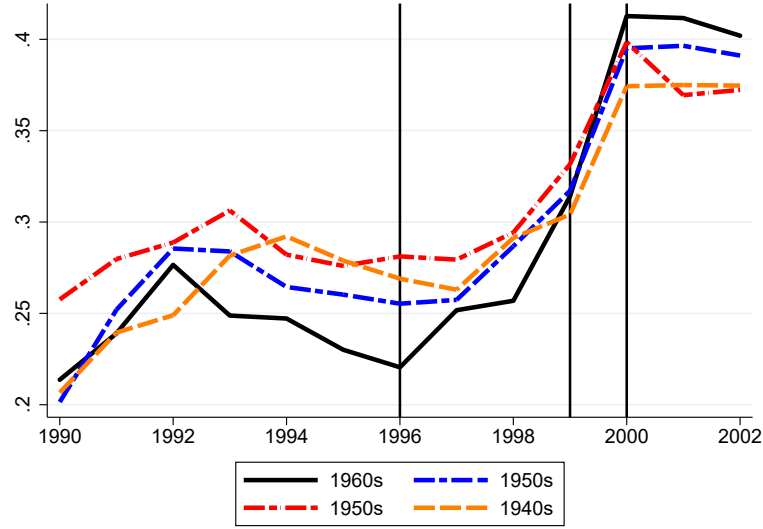
Figure 4: Stock ownership by income group



Source: Own calculations using SOEP data.

Additionally, I also examine whether stock market participation differs across birth cohorts, as age (along with its linked economic position) correlates with stock investments. I do not consider household heads who are born after 1970, as stock market participation among this group is very low in the 1990s due to their age. Results for the different cohorts are presented in Figure 5. With regard to the different cohorts, I do not observe distinct differences. Stock market participation increases rapidly during the period of the three Telekom IPOs in 1996-2000 for all groups. In particular, the 1960s cohort, which had the lowest stock ownership, experiences the largest increase and outperforms the other cohorts. Overall, my descriptive results indicate that the Telekom event was not just popular for specific income classes or cohorts but rather

Figure 5: Stock ownership by cohort

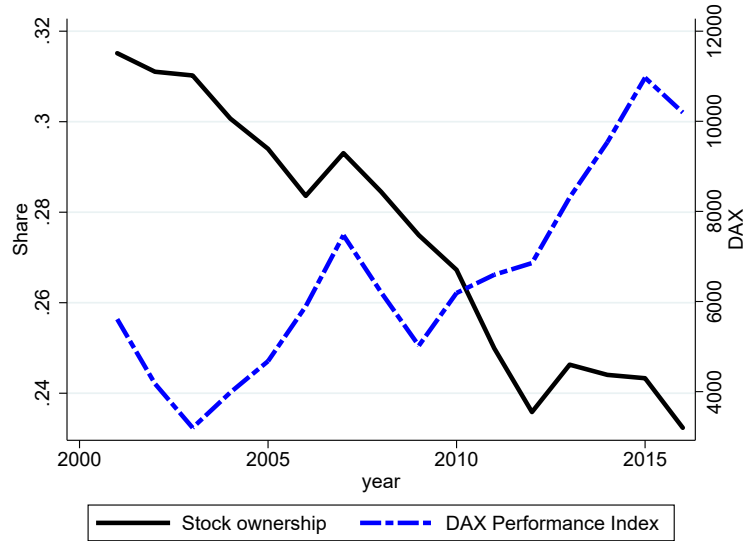


Source: Own calculations using SOEP data.

was a universal phenomenon, thus supporting the mass nature of the event.

3.3 Stock investment of German households after the Telekom event

Figure 6: Stock ownership: 2001-2016



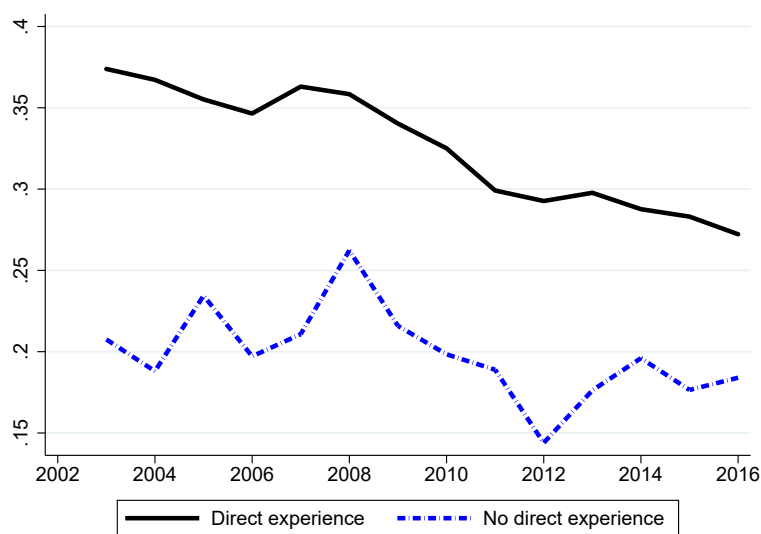
Note: This figure presents the share of German households that report to have positive holdings of stocks (direct- or indirect holdings). Note that starting from 2001, the SOEP provides information of stock holdings separately from fixed-income security ownership. Source: Own calculations based on SOEP data.

Since the crash in 2000, stock ownership continuously decreased without any remarkable recovery through 2016 (Figure 6). In 2007 and 2013, stock ownership seems to slightly increase,

however the magnitude is rather small and not long-lasting. This is remarkable, given the fact that stock prices have steadily increased, despite crash periods during the Global Financial Crisis of 2008/9.¹³

To shed light on whether this persistent decrease in stock market participation relates to the Telekom experience, I distinguish between households that were at least twenty years old during the crash (solid black line), as they are more likely to have directly experienced the crash than household heads younger than twenty (dashed blue line). Results are presented in Figure 7. Since 2000, stock market participation has gradually decreased for those with direct experience, showing no recovery. Compared to this, households with young heads seem to be rather unaffected by the Telekom event, as stock market participation increases until 2008. For this younger generation, the Global Financial Crisis seems to have a larger impact on their stock market participation decisions, while the older generation does not seem to exhibit any noticeable adjustments during this event.

Figure 7: Stock ownership by Telekom experience



Source: Own calculations using SOEP data.

An additional feature is that stock market participation did not decrease drastically in the immediate aftermath of the Telekom event; rather it fell slowly. This rather slow-moving stock market participation rate of the experienced group may be due to the fact that many retail investors did not immediately sell their T-shares, but rather kept them in their portfolio (even though they did not actively invest in stocks again) or sell them at a later point of time.¹⁴

¹³Daily time series of the DAX Performance Index is presented in Figure 11 in Appendix D.

¹⁴Figure 10 in Appendix D presents entry- and exit-rates of German households after the crash in 2000. I also observe how household heads who did not directly experience the Telekom event invest in stocks in a more active manner than household heads with Telekom experience.

Since the T-shares were only worth 9 EUR each, selling them would have required German households to bear all the losses. Also, as Deutsche Telekom may be “too big to fail,” investors may have expected a recovery in the mid- to long-run. However, this never happened, which may have entrenched the negative emotions of Telekom investors. They can still track the price development of their T-shares, which, in 2021, were worth about 15 EUR per share.

4 Empirical analysis

In this section, I empirically examine the effect of the Telekom event on the investment decisions of German households in 2016. I first introduce the baseline model and then explore two possible channels through which the Telekom event can affect long-term investment decisions. First, I test whether households that directly experienced the Telekom event invest differently than households that did not. Second, I analyze whether emotional attachment matters for the Telekom event. Finally, I investigate the possibility of an intergenerational transfer of these effects.

4.1 Baseline model

My baseline empirical model is a probit. Since I am interested in investment behavior of German households in the current period, I restrict my analysis to the year 2016, which is the latest period available to me.¹⁵ The model is

$$y_i = \alpha + \beta_1 TE_i + \beta_2 A_i(\lambda) + \gamma' x_i + \delta_r + \varepsilon_i, \quad (1)$$

where y_i is an indicator for the stock market investment behavior of a German household i in 2016. I use data from SOEP that indicates households’ ownership of stocks held directly or through mutual funds and calculate three indicators that visualize (i) stock market participation SMP_i , (ii) stock market entry $Entry_i$, and (iii) stock market exit $Exit_i$. SMP_i equals one if household i reports to directly or indirectly own stocks and zero if not. $Entry_i$ equals one if household i does not participate in the stock market in 2015, but participate in 2016, and zero if the household does not participate in the stock market in both waves. Note that households that participate in the stock market both in 2015 and 2016 are not included in this variable. $Exit_{it}$ is equal to one if household i owns stocks in 2015, but not in 2016, and zero if the household participates in the stock market in both consecutive years. In this variable, households that

¹⁵Note that survey respondents report their stock ownership for the previous year. Therefore, information on stock ownership is obtained by the SOEP 2017 wave. Data on households’ socio-economic characteristics that are used as control variables in the regression analysis are obtained by the SOEP 2016 wave.

participate in the stock market in neither year are not considered.

On the right side of the equation, I have four sets of variables. First, x_i contains a set of socio-economic control variables, such as age of the household head, their gender, and their education degree, as well as household-level information, such as household size, income, and wealth. In addition, I include households' subjective evaluation of their willingness to take financial risk.

Second, in the spirit of [Malmendier and Nagel \(2011\)](#), I also include a variable that incorporates the whole information set of past returns of household heads since their birth year with a weighting function. The inclusion of this variable is important to cleanly isolate the Telekom effect from the general stock market situation. As already explained, the Telekom event happened in parallel with the Dotcom bubble burst. Therefore, I need to be sure that my identification of the Telekom event is not driven by other factors in the stock market.

The formula to calculate this variable A_i is

$$A_i(\lambda) = \sum_{k=1}^{age_i-1} \omega_i(k, \lambda) R_{2016-k}, \text{ where} \quad (2)$$

$$\omega_i(k, \lambda) = \frac{(age_i - k)^\lambda}{\sum_{k=1}^{age_i-1} (age_i - k)^\lambda}. \quad (3)$$

The weighting function $\omega_i(k, \lambda)$ determines how households anticipate past experiences of asset returns for their current investment decisions. Therefore, it depends on how far an experienced return (growth) R_{2016-k} is for household i in 2016 (using $age_i - k$ to calculate the distance) and a shaping parameter λ . If λ is positive, nearer experienced returns are more strongly weighted than returns that are far away, and vice versa. For my purpose, I adopt the conventional results in the literature and assume $\lambda = 1$.¹⁶ Since I am interested in stock market investment decisions of German households, I use the yearly growth rates of the DAX index for R_{2016-k} .

Finally, I introduce TE_i , which visualizes the exposure of German households to the Telekom event. For the identification of TE_i , I exploit the panel dimension of the SOEP and track households that are available in the 2017 survey wave that experienced the Telekom event during 1996-2000. By doing so, I consider two dimensions: the effect of direct experiences (*Hypothesis 1*) as well as the effect of emotional attachment (*Hypothesis 2*). A detailed description of the identification strategy of these two channels is presented in the following subsections and also summarized in Table 8 in Appendix C.

¹⁶Robustness exercises with different values of λ are presented in Table 9 in Appendix C.

4.2 The effect of direct experiences

Households that experienced the Telekom event in an active manner are more likely to be affected than households that only experienced it indirectly. As a first identification strategy, I assume that household heads, who were at least twenty years old in the year of the crash, had a more direct experience as they may have not only noticed the media presence of the T-shares, but were also more likely to have actively invested. In turn, household heads younger than the age of twenty were too young to actively notice the severeness of the situation at that time.¹⁷

TE_i is thus defined as:

$$TE_i = \begin{cases} 1 & \text{if age} \geq 20 \text{ in } 2000 \text{ and} \\ 0, & \text{otherwise.} \end{cases} \quad (4)$$

In Table 3, I present the marginal effects at the mean of TE_i estimated with equation (1) for the three different dependent variables introduced above. Besides the general stock market participation indicator, entry- and exit-behavior sheds additional light on whether households with direct Telekom experience also adjusted their *active* investment decisions in the stock market. Again, note that I estimate the model for 2016.

Table 3: The effect of direct experience: marginal effects at the mean

	SMP (1)	Entry (2)	Exit (3)
Direct experience (β_1)	-0.59***	-0.92***	-0.89***
Stock returns (β_2)	-2.87	30.04*	21.47
Controls	yes	yes	yes
Constant	yes	yes	yes
Region FE	yes	yes	yes
Observations	4466	2577	1889
Pseudo R^2	0.19	0.11	0.16

Note: This table presents the marginal effects of TE at the mean, with TE capturing direct vs. no direct experience of the Telekom event. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

For all three specifications, the Telekom dummy is highly significant. First, households with direct experience invest significantly less in stocks than households that are not. This result

¹⁷This threshold is also chosen based on the fact that data on household heads younger than twenty is scarce and, thus, choosing a smaller threshold may lead to unreasonable results. Robustness exercises with a different threshold are provided in Table 10 in the appendix. Section 4.4 addresses the issue that children may also have experienced the Telekom event through their parents.

confirms my first hypothesis that the Telekom event has significantly affected the stock market investment decisions of German households. This is remarkable as unconditional stock market participation is substantially higher for older household heads (see Figure 7). In addition, the directly experienced group is also rigid in their *active* investment behavior, i.e. they are much less likely to enter or exit the stock market.¹⁸

It is also worth mentioning the effect of the past experienced DAX returns (β_2). My results show that past stock returns typically do not have a significant effect on investment decisions of German households. It is only for entry decisions that it has a weak significant impact. At first glance, this result seems to contradict the message of [Malmendier and Nagel \(2011\)](#) and [Ampudia and Ehrmann \(2017\)](#), who show that households anticipate their life-time experiences of returns when making investment decisions today. However, they also discuss in their paper that a parametric approach to determine the shape of the weighting function may be problematic, as it does not account for extreme events. [Ampudia and Ehrmann \(2017\)](#) confirm this concern by showing that extreme events, like the Global Financial Crisis of 2008, can have persistent effects on the investment decisions of euro area households. Therefore, the long-lasting effect of the Telekom event serves as an indication that German households seem to weight this event so strongly that they do not anticipate fluctuations in the stock market for their stock market participation decisions.

4.3 The effect of emotional attachment

As a next step, I address my second hypothesis and focus on the group of households that directly experienced the Telekom event. Within this group, I test whether the degree of emotional attachment amplifies its persistent effect on long-term investment behavior.

For identification, I assume households that actively invested in the T-shares are likely to be more emotionally attached to the event, as they have experienced losses to their wealth. This group of households is defined as the “Telekom investors.” In order to cleanly identify this effect, I use synthetic control methods ([Abadie et al., 2010](#)) and contrast the Telekom investors (which is the treatment group, with emotional attachment being the treatment) with a control group of households that (i) experienced the Telekom event (as defined in section 4.2), (ii) exhibit similar socio-economic characteristics as the Telekom investors, but (iii) did not invest in the T-shares.

Unfortunately, the SOEP does not provide information on the detailed portfolio composition of households, meaning that exact information on T-shares investment is not available.

¹⁸One might ask why exit rates are lower for households with direct experience, as one may think that they are more likely to exit the stock market. However, the results are for 2016 and not directly after the crash. Further, lower entry- and exit rates can be interpreted as generally more rigid behavior in stock investment.

Therefore, I must make assumptions that provides a proxy for T-shares investment. I utilize information from the SOEP and define that households have a high probability to have invested in the T-shares if they first entered the stock market during the first three IPOs. This group of households is defined as the “Telekom investors.” Next, I use their characteristics in the year 2000, apply propensity score matching on the control pool (households that have experienced the Telekom event without direct investment), and search for the treatment group’s nearest neighbor.¹⁹ Finally, I track these two groups to the year 2016. The Telekom indicator TE_i is thus

$$TE_i = \begin{cases} 1 & \text{if direct experience and investment in T-shares,} \\ 0 & \text{if direct experience but no investment.} \end{cases} \quad (5)$$

Table 4: The effect of emotional attachment: marginal effects at the mean

	SMP (1)	Entry (2)	Exit (3)
Emotional experience (β_1)	−0.12**	−0.18***	−0.02
Stock returns (β_2)	−16.82	36.50*	17.03
Controls	yes	yes	yes
Constant	yes	yes	yes
Region FE	yes	yes	yes
Time FE	yes	yes	yes
Observations	468	227	183
Pseudo R^2	0.27	0.36	0.33

Note: This table presents the marginal effects of TE at the mean, with TE capturing the emotional attachment to the Telekom event. SMP stands for stock market participation. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4 presents the results for (1) stock market participation, (2) stock market entry, and (3) stock market exit. In addition to direct experience, the results indicate that emotional attachment to the Telekom event matters as well. Households that have the highest potential to have actively invested in T-shares are 12% less likely to invest in stocks and are 18% less likely to enter the stock market. However, households with high emotional attachment to the Telekom event do not significantly differ from other households when they make exit decisions.

¹⁹I use Mahalanobis propensity matching setting a caliper to 0.1 of the standard deviation. Results remain robust when taking other values.

4.4 The effect of indirect experiences: Intergenerational transfer

The previous exercises show how (i) households with *direct* experience of the Telekom event invest significantly less in stocks compared to households that do not, and (ii) households that have higher emotional attachment to the event due to active investment in T-shares invest differently compared to households that have just witnessed the event. Finally, I also address an additional hypothesis on whether experiences of parents can transfer to children, thereby indirectly influencing their investment decisions. In the literature, studies confirm the relevance of intergenerational transmission with respect to trauma (Dekel and Goldblatt, 2008; Lev-Wiesel, 2007), risk- and trust attitudes (Charles and Hurst, 2003; Dohmen et al., 2006), and poverty (Bird, 2013). The SOEP provides a good base for this kind of intergenerational exercise, as the data tracks children of survey respondents over time.

For this exercise, I distinguish between two groups of children, differing with respect to the nature of the parental experience of the Telekom event. The first group comprises children of Telekom investors, where I assume that the negative emotional experience of their parents is transmitted to the children, thus with the potential to indirectly affect their investment decisions. The second group includes children of the so-called “experienced investors,” who I define as household heads who regularly invest in the stock market. I approximate this based on how frequently they report owning stocks: if they report investments in more than half of survey waves, then I assume that they regularly invest in stocks. My assumption is that this group has the least emotional attachment to the Telekom event, as they are more experienced investors and, thus, are less likely to be affected by a single stock market event.²⁰ Therefore, experienced investors can be Telekom investors at the same time, but they are less likely to be emotionally exposed to the event.

Then, I follow these two groups of children to the 2017 survey wave and analyze their stock market participation, once they become household heads themselves.²¹ I use the same empirical model of equation (1), where TE_i is defined as follows:

$$TE_i = \begin{cases} 1 & \text{if children of Telekom investors,} \\ 0 & \text{if children of experienced investors.} \end{cases} \quad (6)$$

²⁰Table 11 in the appendix presents summary statistics of experienced investors’ socio-economic characteristics in comparison to (i) the German average and (ii) Telekom investors.

²¹I restrict the children, who are household heads of a new household, to be younger than 45. This decision is based on the fact that I want to ensure that children were sufficiently young during the Telekom event that they were not actively involved in investment decisions of the household. If I do not restrict the sample, the results remain robust.

Table 5: Summary statistics of children, 2017

	Experienced investor children		Telekom investor children	
	Mean	SD	Mean	SD
<i>Demographics</i>				
Sex	0.51	0.50	0.50	0.50
Age	33.14	6.71	30.52	4.33
Married	0.28	0.45	0.23	0.43
Number of children	0.36	0.75	0.29	0.65
Household size	1.96	1.04	1.88	0.95
High school degree (Abitur)	0.56	0.50	0.32	0.47
University degree	0.63	0.48	0.33	0.47
Degree in Economics	0.13	0.34	0.03	0.17
Employment	0.78	0.42	0.81	0.40
Former FRG/GDR	0.79	0.41	0.61	0.49
Total family income	39250.64	23907.93	33110.62	18839.40
<i>Financial decisions</i>				
Riskl. asset ownership	0.93	0.25	0.91	0.29
Stock ownership	0.57	0.50	0.18	0.39
Home ownership	0.28	0.45	0.26	0.44
Fin. risk taking	3.36	1.77	2.95	1.83
<i>Wealth</i>				
Financial wealth	39299.97	64719.38	15988.60	30009.77
Net wealth	138853-21	203192.91	78415.76	124049.70
Home equity	51113.51	117010.20	42505.03	93879.09
Real estate	6918.30	60340.55	6841.12	30149.25
Asset income	1162.49	2500.34	497.70	1550.65
Observations	230		69	

Note: Telekom investors are defined as household heads who first owned security papers during the three IPOs of the Deutsche Telekom shares. Experienced investors are household heads with over 50% security papers ownership during their participation in the survey. For 2002 and 2017, the SOEP wealth module is available. *Source:* Own calculations based on SOEP data.

Table 5 presents the socio-economic characteristics of these two groups. Children of Telekom investors and of experienced investors differ greatly in their characteristics, with children of experienced investors having much higher education degree, as well as higher income and wealth. Particularly interesting is the difference in their stock ownership: while almost 60% of the children of experienced investors own stocks, only 18% of the Telekom investor children do. This difference is substantial compared to other asset ownership, such as riskless assets and home ownership. Finally, their willingness to take financial risk differs greatly as well.

Finally, Table 6 presents the results of the regression analysis for stock market participation using equation (1).²² The regression analysis shows that children of Telekom investors are 53% less likely to participate in the stock market, after controlling for all relevant control variables.

²²As data is scarce for children in general, there is not enough data points to analyze their entry- and exit behavior.

This difference is statistically significant, thus confirming the effect of indirect experience of such emotional events on investment decisions.

Table 6: Determinants of stock market participation of children, marginal effects at the mean

	SMP
Direct experience (β_1)	-0.53***
Stock returns (β_2)	152.93
Controls	yes
Constant	yes
Region FE	yes
Observations	167
Pseudo R^2	0.38

Note: This table presents the marginal effects of being a child of a Telekom investor (at the mean) on stock market participation. SMP stands for stock market participation. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

5 Conclusion

I utilize insights of a unique stock market event in Germany to examine whether emotionally-tagged events can have long-term effects on the investment behavior of households. My empirical analyses confirm its effect by showing that it is not just the experience itself, but also the degree of emotional attachment that matters for determining the long run investment patterns of affected households. Further, I also provide first-order evidence on the far-reaching consequences of such events by showing how the children of parents emotionally affected by the Telekom stock crash are still less likely to invest in the stock market than those children whose parents had less emotional attachment to the Telekom event.

Emotionally driven traders are not scarce in reality and stock market crashes are somewhat inevitable. Therefore, it is important to understand the underlying psychological channels that can provoke the emotional tagging of households and permanently close their doors to the stock market. Persistent non-participation can have severe negative consequences for households: according to a monthly report of the German Bundesbank, most German households have barely changed their savings and investment behavior since the emergence of the low interest rate environment, even though they are fully aware of the consequences of negative interest rates ([Deutsche Bundesbank, 2015](#)). This implies that German households - who mostly save their

money in form of deposits - are missing out on equity premia that is especially important for long-term wealth accumulation in times of long-enduring low interest rates. Although I do not argue that the Telekom event is the main driver underlying such behavior, my empirical analysis introduces an important channel demonstrating that emotional-tagged events can persistently affect investment decisions.

For instance, insights of the Telekom event suggests *betrayal of trust* as an important determinant for the outbreak of long-lasting negative emotions after the crash. Indeed, many studies confirm the importance of trust on stock market participation ([Guiso et al., 2008](#); [Georgarakos and Pasini, 2011](#); [Pevzner et al., 2015](#)). Therefore, policies that help maintain a healthy trust relationship between investors and companies can help avoid such emotionally attached events.

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A Sentiment analysis

In this appendix, I present how I conduct a sentiment analysis using newspaper articles from the *Handelsblatt*. The data is provided by the Forecasting and Economic Policy Department of DIW Berlin. All articles are converted in XML-format. For my purpose, I utilize articles from 1998 through 2002.

1. Import all articles (XML-Document) using Python. The XML format includes tags that indicate the topic of a certain article. Use category “Firms” and extract all articles that report news about Deutsche Telekom within this category. This includes all sort of information of the company, starting from sport sponsorship to IPOs. Afterwards, manually filter out articles that exclusively include information on Telekom shares. See Table 7.
2. Tokenize and lemmatize all texts using Natural Language Toolkits in Python (SpaCY).
3. Apply lexicon-based sentiment analysis using *SentiWS* (Sentiment WortSchatz), which is a publicly available German-language resource provided by [Remus et al. \(2010\)](#). This provides a list of positive and negative sentiment-bearing words that are weighted within the interval of $[-1, 1]$, which is used to evaluate the average tone of an article.
4. Consistency check: Manual screening of all relevant articles and categorize between (i) negative, (ii) neutral, and (iii) positive. Compare my evaluation with others and with the results produced with *SentiWS*.²³
5. Calculate the yearly average of all Telekom shares articles that are available within a year. Afterwards, compute the growth rate of the yearly sentiment measures.

Table 7: Newspaper articles on Deutsche Telekom

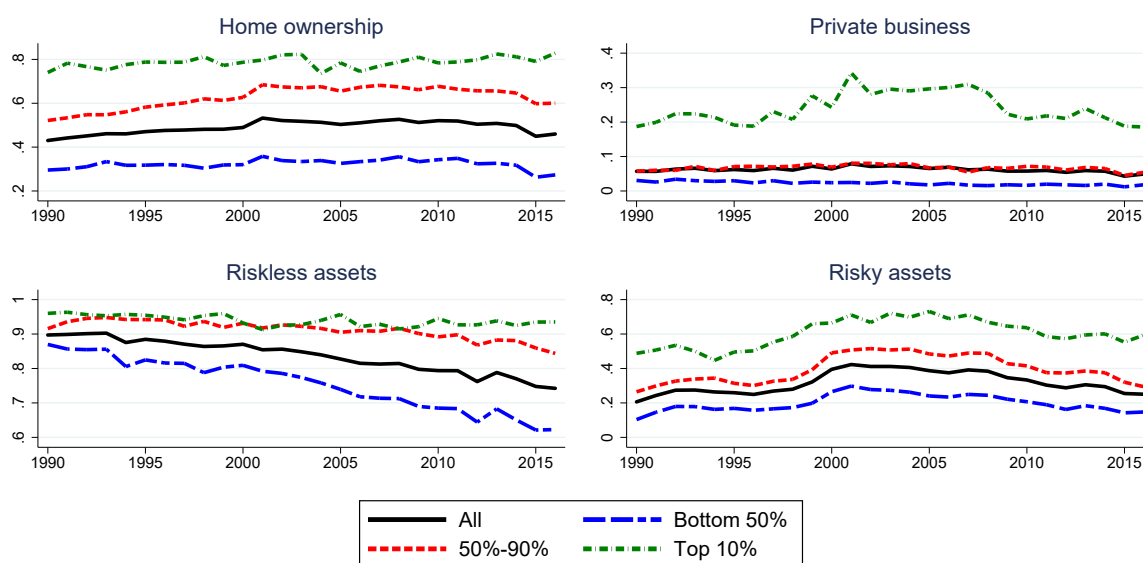
Year	# Deutsche Telekom	# Telekom shares
1998	242	44
1999	286	77
2000	322	120
2001	299	115
2002	269	124

²³I thank Till Baldenius for his excellent support.

B Asset ownership of German households: 1990-2016

How do German households invest and which asset type is particularly popular? Did investment decisions change over the last 26 years? I provide answers to these questions using by utilizing information from the SOEP. To be specific, I provide descriptive statistics of German households' ownership of four different asset categories: (i) riskless assets, which include banking saving deposits, mortgage saving plans ("Bausparvertrag"), life insurance policies, and saving bonds, (ii) risky assets (security papers of listed companies including stocks, bonds, and equity warrants held directly or through mutual funds), (iii) home ownership, and (iv) private businesses. In addition, I divide the sample into three income groups (bottom 50%, 50%-90%, and top 10%). Figure 8 presents the time series from 1990 to 2016.²⁴ The black solid line represents the German average. On average, 49% of German households have reported to own a main dwelling, 6% have a business, 84% have invested in riskless financial assets, and 32% own risky assets.

Figure 8: Ownership of assets across different income groups



Source: Own calculations using SOEP data.

When it comes to non-financial assets (main dwelling and private businesses), ownership rates seem to have barely changed between 1990 and 2016. The only noticeable change observed is in business ownership of households in the top 10%; however, it is more of a temporary increase in business holdings during 1996-2007 that reverts after the Global Financial Crisis period, instead of a persistent change.

²⁴Strictly speaking, the survey waves are 1991 to 2017. Households report their asset ownership of the *previous* year.

A large fraction of German households own riskless financial assets, with more than 90% of the top 50% of the income distribution claiming ownership of these assets. While these numbers also remain quite stable over time, I observe a slightly declining trend in riskless asset ownership among the bottom 50% income distribution. While 87% of them owned riskless assets in 1990, only 63% did so in 2016. In case of risky financial asset holdings, the share increases between 1995 and 2000 for all income groups. Afterwards, ownership declines - again for all income groups - in a gradual manner.

C Tables

Table 8: Identification of TE

	Hypothesis	Identification	Control group
Direct experience	The Telekom event led to less stock market participation among German households	Household heads who were younger than 20 in 2000 were old enough to directly experience the Telekom event	Household heads who were younger than 20 in 2000
Emotional experience	Households that have higher emotional attachment to the Telekom event invest less in stocks	Households that have invested in Telekom shares are likely to have high emotional attachment to the event, as they experienced real losses to their wealth (<i>Telekom investors</i>)	Households that experienced the Telekom event, but did not invest in T-shares
Indirect experience	Traumatic stock market experiences can even have an impact on investment decision of households that did not directly experience it.	Children of Telekom investors may have noticed the emotional turbulence of their parents and anticipate this experience when they make their own investment decisions	Children of experienced investors, i.e. parents who have high participation rate in the stock market throughout the survey waves

Table 9: The effect of direct experience: different λ

	SMP (1)	Entry (2)	Exit (3)
$\lambda = 0$			
Direct experience (β_1)	-0.52	-0.90***	-0.86***
Stock returns (β_2)	-1.94	-0.12	-6.36
Observations	4466	2577	1889
Pseudo R^2	0.19	0.12	0.16
$\lambda = -1$			
Direct experience (β_1)	-0.42***	-0.92***	-0.88***
Stock returns (β_2)	-0.19	-0.00	-0.55
Observations	4466	2577	1889
Pseudo R^2	0.19	0.12	0.17
Controls	yes	yes	yes
Constant	yes	yes	yes
Region FE	yes	yes	yes

Note: *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10: The effect of direct experience: different age threshold equal 30

	SMP (1)	Entry (2)	Exit (3)
Direct experience (β_1)	-0.24	-0.98***	-0.88***
Stock returns (β_2)	-3.11	38.46	32.46
Controls	yes	yes	yes
Constant	yes	yes	yes
Region FE	yes	yes	yes
Observations	4466	2577	1889
Pseudo R ²	0.19	0.10	0.15

Note: *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

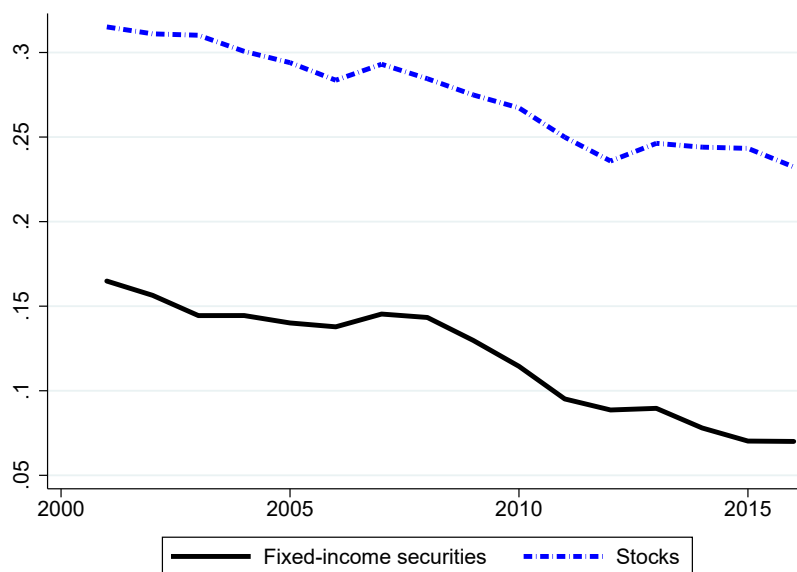
Table 11: Summary statistics

	German average		Experienced investors		Telekom investors	
	mean	sd	mean	sd	mean	sd
<i>Demographics</i>						
Sex	0.63	0.48	0.66	0.47	0.67	0.47
Age	46	13.33	47	13.02	45	12.39
Married	0.57	0.50	0.62	0.48	0.55	0.50
Number of children	0.54	0.91	0.46	0.84	0.47	0.83
Household size	2.41	1.27	2.39	1.19	2.34	1.19
High school degree (<i>Abitur</i>)	0.17	0.38	0.33	0.47	0.22	0.41
University degree	0.18	0.39	0.37	0.48	0.23	0.42
Employment	0.63	0.48	0.72	0.45	0.74	0.44
Former FRG/GDR	0.80	0.40	0.84	0.37	0.77	0.42
Total family income	34791.66	20697.43	47277.93	26572.32	37746.20	19961.38
<i>Financial decisions</i>						
Riskl. asset ownership	0.87	0.33	0.97	0.16	0.98	0.15
Stock ownership (proxy)	0.26	0.44	0.81	0.39	1.00	0.00
Home ownership	0.41	0.49	0.56	0.50	0.47	0.50
Asset income	1393.97	8107.94	4293.37	17811.90	1378.77	4015.32
Fin. risk taking	2.35	1.99	3.15	2.09	2.66	1.97
Observations	5730		882		1261	

Note: Experienced investors are household heads with over 50% security papers ownership during their participation in the survey. Household heads who have reported to own security papers in 1996, 1999, and 2000 (but not before) are defined as Telekom investors. For the German average and experienced investors, I present the summary statistics of 1995, before the beginning of the Telekom event. Summary statistics of the Telekom investors refer to their characteristics in the year of their stock market entry. *Source*: Own calculations based on SOEP data.

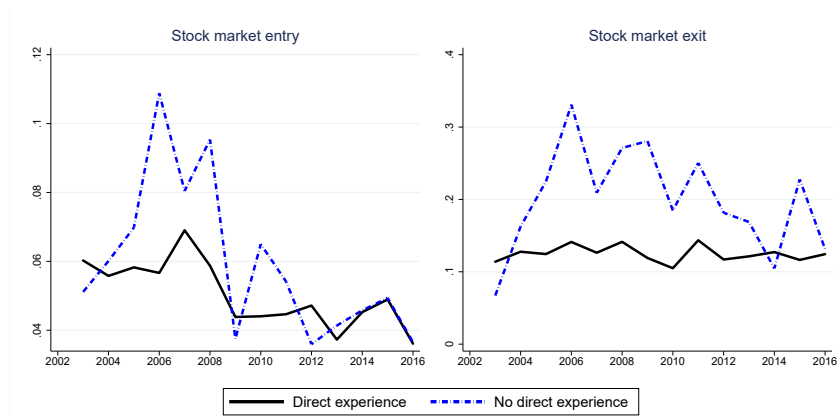
D Figures

Figure 9: Fixed securities ownership vs. stock ownership



Source: Own calculations using SOEP data.

Figure 10: Stock market entry and exit



Source: Own calculations using SOEP data.

Figure 11: DAX performance index



Source: Datastream.