

# The Consumption Effects of the Disposition to Sell Winners and Hold on to Losers\*

Benjamin Loos, Steffen Meyer, and Michaela Pagel

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## Abstract

Using a large sample of transaction-level data on all security trades and holdings as well as all spending and income from an online retail bank, we study the effects of a fictitious sale initiated by the bank that changed the displayed purchase prices of all mutual funds in individuals' portfolios. We find that individuals are more likely to sell fictitious winners, i.e., funds that are displayed as winners under the new purchase price but are losers under the actual purchase price. Beyond affecting individual's disposition to sell winners and hold on to losers, we also document that individual consumption increases in response to realizing fictitious capital gains. To the best of our knowledge, this is the first study documenting a causal link between purchase prices and trades using observational data and finding that the disposition to sell winning investments has real effects in terms of affecting individual consumption. Additionally, our finding that the subjective feeling of investment success and fictitiously changed capital gains affect consumption is informative for the marginal propensity to consume out of stock market wealth.

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# 1 Introduction

Stock and mutual fund holdings represent a significant fraction of household financial wealth – comparable to the stock of housing wealth. Fluctuations in stock prices should thus significantly affect households’ investment, savings, and consumption decisions. Furthermore, fluctuations in stock prices may be a source of emotional stress which may cause household’s reluctance to invest into the stock market in the first place (Campbell, 2006). Unlike house prices, stock prices are very volatile amplifying consumption responses as well as emotional stress. Furthermore, unlike houses, stocks can be easily monetized if consumption needs arise or households experience stress and changes in beliefs about the stock market performance or preferences for risk taking. There exists a large empirical literature documenting that individuals prefer to sell winning stocks and hold on to losing stocks (see Odean, 1998; Chang et al., 2016). This finding is difficult to rationalize within standard economic models suggesting the importance of non-standard preferences or beliefs. However, whether investing into losing or winning stocks has real effects in changing consumption as well as empirical evidence on how much individuals consume out of stock market wealth remains scarce.

Clearly, estimating the marginal propensity to consume out of investing into winning stocks or stock market wealth more generally is difficult. Individuals decide to trade successful or unsuccessful investments endogenously in response to individual shocks to consumption needs or in response to aggregate fluctuations in consumer confidence, which depend on other macroeconomic variables, such as income growth. Therefore, the relationship between trading, individual consumption, stock price fluctuations, and other aggregate variables is subject to common shocks. However, not only the economic environment, individual income, or changes in preferences will affect consumption, but also subjective feelings of being wealthy and being a successful investor is likely to affect consumption. After all, psychologists long know that “rich or poor is a state of mind” (Tang et al., 2004). Beyond showing that feelings of investment success, or having invested in winning as opposed to losing stocks and funds, affects trading (Odean, 1998), the open questions we are trying to answer are how much such subjective feelings matter and whether such behavior has any real consequences

in terms of affecting consumption.

To investigate the effect of selling a winning investment on individual investor consumption, we use a unique panel dataset on the daily trading of more than 100,000 private investors in Germany spanning the years 2003 to 2018. We precisely measure each individual's daily activity by his or her log in and trading behavior as well as all of his or her transactions and balances in his or her settlement, savings, and checking accounts. As a source of exogenous changes in the subjective feeling of investment success, we utilize the implementation of a capital gains tax reform in Germany in January 2018. The capital gains tax reform was implemented to simplify the tax treatment of retaining foreign funds and, importantly, did not have any real implications for individual tax liabilities. To simplify the process of assessing capital gains taxes and subtracting them at the source for retaining foreign funds, the online bank providing our data (as well as the majority of other banks) initiated a fictitious sale that changed all displayed purchase prices of all funds and ETFs (but no other investments) to take the December 29 2017 closing price, as quoted by the exchange, on January 1st, 2018, and used that price to display individual's absolute capital gains and losses as well as their percentage returns thereafter.

We estimate the effects of these changes in the displayed purchase price and capital gains or losses on trades using a linear probability model as is standard in the disposition-effect literature. In turn, we use a fixed-effects time-series approach to estimate the effect of realizing fictitious capital gains on individual consumption. Because we control for the actual realized capital gains of all liquidations, and the fictitious capital gain due to the fictitious sale is exogenous to each individual, we estimate the causal marginal propensity to consume out of 1 Euro of fictitious capital gains. We find that individuals are affected by the change in the purchase price and their displayed capital gains or losses: their likelihood to sell a fund is 4.09% higher when funds are displayed as winners since the 1st of January 2018 purchase price even though they are losers relative to the actual purchase prices and 0.82% lower when funds are losers now even though they were winners. Whether or not we observe a disposition effect for funds in the baseline depends on the time period and subsample we look at.<sup>1</sup> Furthermore, we find that individuals, on average, consume approximately 38%, measured

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<sup>1</sup>In our sample of 103,000 German investors over the period 2003 to 2018, we find an attenuated sometimes

in ATM withdrawals and point-of-sale transactions, out of each dollar of fictitious capital gains in their funds.

By estimating the effects of endogenously changed purchase prices on the disposition to sell winners and hold on to losers, we contribute to the large literature on the disposition effect. The initial finding by Odean (1998) was further analyzed in a number of follow-up papers such as Barber and Odean (2000) as well as Chang et al. (2016); Kaustia and Knüpfer (2008); Koestner et al. (2017); Meng and Weng (2016) among many others and theoretically explained in Barberis and Xiong (2009); Shefrin and Statman (1985); Barberis and Xiong (2012) among others. More specifically, our findings are related to a few recent papers on the disposition effect. We follow Frydman and Wang (fthc) in providing causal evidence for the disposition effect. In contrast to an exogenous change in the purchase price, Frydman and Wang (fthc) analyze a change in the salience of purchase prices from a natural experiment in which the online broker added price variables and changed the coloring of gains and losses. This paper follows Frydman and Rangel (2014) who show in a laboratory experiment the effects of displaying or omitting individual purchase prices. Additionally, Birru (2015) also finds that retail investors confuse winning and losing stocks after stock splits rather than adjusting their purchase price points properly. Furthermore, the different effects of fake winners versus losers suggest that individuals are happy to take a fictitious winner at face value and close the mental account (as suggested in Frydman et al. (2017)). Our results are also relevant to the two main potential confounders of the disposition effect: (1) tax implications and (2) performance or optimal strategies. (1) Selling a fake winner when individuals misperceive the new purchasing price as the more tax-relevant one, is clearly less tax efficient than selling a loser. (2) If individuals would follow some optimal strategy in their selling behavior, even if that cannot be shown in their performance (see Odean, 1998, for instance), then they should not be affected by the artificial change in the purchase price.

Furthermore, our paper relates to a literature on how gains and losses affect retail investors. The literature has analyzed risk-taking in response to losses in a variety of settings, including positive and sometimes negative disposition to sell winning mutual funds. Chang et al. (2016) use the data from Odean (1998) consisting of 73,558 US households from January 1991 to November 1996 and document a reverse disposition effect for delegated investments such as mutual funds.

choices over lotteries in laboratory experiments (Thaler and Johnson, 1990), trading decisions of experienced market-makers (Coval and Shumway, 2005), IPO investors (Kaustia and Knüpfer, 2008; Anagol et al., 2015), and individuals receiving inheritances (Andersen et al., 2018). Beyond trading decisions, our findings are more broadly related to the literature on how personal experiences shape preferences, such as Malmendier and Nagel (2011) and Andersen et al. (2018). Meyer and Pagel (2018) show that individuals appear to learn from bad experiences in the stock market such as investing into a losing fund that liquidates complementing the experimental evidence in Kuhnen (2015). Furthermore, individuals appear to become more risk averse in response to losses as in Koudijs and Voth (2016). To understand individual preferences for investing into stocks and funds is of importance for long-standing puzzles in household finance such as the stock market-non-participation puzzle.

Finally, by estimating the consumption response to capital gains, this paper contributes to the literature linking stock market wealth with consumption, which includes studies employing aggregate and regional variation (e.g. Davis et al. (2001), Dynan and Maki (2001), and Case et al. (2005)).<sup>2</sup> However, endogeneity concerns are likely to affect the interpretation of the estimates in these existing studies, as they use aggregate data and cannot distinguish between the direct effect of changes in stock wealth on consumption and the fact that stock prices are a leading indicator of economic growth and reflect consumer sentiment. There also exist studies employing household-level data but lack disaggregated data on households' actual stock holdings (e.g. Parker (1999) and Baker et al. (2007)). Specifically, Baker et al. (2007) uses CEX data and shows that stockholder's consumption responds strongly to changes in dividend payments but not to changes in stock prices. They also provide suggestive evidence that this behavior is driven by mental accounting. Furthermore, Maggio et al. (2017) use disaggregated household consumption and asset holdings data from the Swedish wealth registry. They instrument contemporaneous stock market returns with those returns that the household would have had if it were not to change its stock allocation. Finally, Meyer et al. (2018) estimate the MPC out of realized capital gains using mutual fund liquidations as an exogenous source of forced sale events.

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<sup>2</sup>See Poterba (2000) for a survey of the literature.

## 2 Data, summary statistics, and institutional background

### 2.1 Data

Our data set stems from clients of one of the largest online banks in Germany.<sup>3</sup> We have daily information regarding logins (from 2012 onwards), trades, and portfolio holdings of approximately 103,000 customers as well as all balances and transactions of each investor's other accounts at the online bank from 1999 to 2016. We keep only private investors that reside in Germany and obtain data on customer demographics such as gender, age, occupation, and zip code location. In online banks, silent attribution is a common phenomenon, as usually there is no charge for having an account. Therefore, in order to not analyze accounts of investors who stopped trading, we require that individuals execute at least 1 trade per year. An advantage of our data set is that we can exclude quasi-automatic trades, such as savings plan transactions. Additionally, trading decisions in our sample are not moderated by any influence from third parties, such as financial advisers. To further ensure that our sample includes only self-directed online consumers, we exclude trades from limit orders, because this type of transactions do not reflect current trading decisions of investors. For each trade, we obtain detailed information on the security such as asset class, risk class, issuer or issue date.

Our sample is not representative for the German population as a whole; less than half of Germans are invested into equities, either directly or indirectly. However, it is a relatively representative sample of self-directed retail investors in Germany. Our sample does not comprise the entirety of the bank's customer base, but a roughly 10 percent sample of all customers. The bank did not pick the sample of retail investors by trading frequency but rather chose a random subsample of all bank users who held a brokerage account. In that sense, our sample is representative for individuals in Germany that participate in the stock market. The average age of investors is 53 and the median age is 52. 16.9 percent of our sample is female and 83.1 percent is male. Brokerage clients are generally expected (Cole et al., 2014) and found to be more sophisticated than the overall population (Dorn and Huberman, 2005). The same is true for our sample: 7.8 percent of our investors hold a doctoral

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<sup>3</sup>The five largest online banks in Germany are (as of 2016): ING-Diba. (8.3 million customers), Deutsche Kreditbank (3.3 million), comdirect (2.1 million), Volkswagen-Bank (1.1 million), and Mercedes-Benz-Bank (1.1 million).

degree, which is higher than average in the German population (of Statistics, 2011, 1.1%).

Investors own portfolios that are worth 55,836 Euros, on average. These descriptive statistics are comparable to those reported by household finance studies using US-data (Barber and Odean, 2000). In addition, we compare average portfolio values to official statistics in Germany. The Deutsche Bundesbank (2013) reports the average portfolio value of a German stock market investors to be around 48,000 Euros. This value seems comparable to the average values we observe in our sample. Additionally, we compare portfolio holdings to self-reported gross annual household incomes for those investors who reported these data. Since income is reported in several ranges, we use the midpoint of each range as a proxy for investor income. The mean ratio of the average portfolio value (over the entire sample period) to annual income is 1.3. For comparison, the ratio of total financial assets to gross household income in the German population is about 1.1 (of Statistics, 2008; Bundesbank, 2013).

## 2.2 Summary statistics

Every investor in our sample who holds a mutual fund was affected by the exogenous change in the purchase price. Of the 103,000 clients we observe, we have 37,785 clients who had at least one sale between January 1, 2018, and June 30, 2018, with complete records including all trading and all other transactions. Of those 27,545 clients were affected because they held funds and all funds got repriced. For January 2017 until June 2018 at the time of each sale, investor held portfolios of 133,726 Euros on average with a median value of 49,906 Euros. The average value of fund holdings is 21,868 Euros. The average fund share was 18.28%.

Table 1 shows detailed summary statistics for our universe of investors.

[Insert Table 1 about here]

Figure 2 shows a distribution of the positions in all non-fund securities and all funds that are sold before 2018 relative to their returns. We can clearly see that individuals are more likely to sell winners, i.e., securities with individual returns that are positive, for both funds and all other securities.

[Insert Figure 2 about here]

Figure 3 shows a distribution of the positions in all fund securities in 2018 relative to their returns since January 1st, 2018, (or December 29, 2017, closing price, as quoted by the exchange) and all funds that are sold relative to their returns since January 1st, 2018. We can clearly see that the majority funds' returns since January 1st, 2018, are slightly negative, given that the market did not perform too well, but all sold funds' returns since January 1st, 2018, are positive, i.e., there is more probability mass in the bar representing 0 to 5% returns. Thus, in the raw data we see that individuals are more likely to sell winning funds relative to their December 29, 2017, closing price, i.e., their fictitious sale price.

[Insert Figure 3 about here]

Figure 4 shows a distribution of the individual changes in the fund returns, i.e., the return from December 29 2017 to the date the position was sold in 2018 minus the return from the purchasing date to the date any position was sold in the portfolio. We compute the two returns for all positions whenever a security was sold or using the June 30th date as the date for unsold positions. The upper panel shows this for all fund positions (sold and unsold), whereas the lower panel focuses on sold fund positions only. We can clearly see that the repricings resulted in very different displayed returns and that most repricings by themselves resulted in a negative artificial return. However, for the funds that were sold, there is clear probability mass in the bar representing a return from 0 to 5%.

[Insert Figure 4 about here]

Clearly, the fund repricings do not represent an actual wealth shock but only a fictitious shock to the subjective feeling of investment success and wealth.

Table 2 shows detailed summary statistics for all held funds and all securities when they were sold or not. The table shows the purchase and repriced share prices as well as the sale prices, and the average price right before the repricing in December 2017.

[Insert Table 2 about here]

Table 3 shows the propensity to sell at a gain or loss of our investors for all securities. The propensity to realize gains is defined as all realized gains relative to all (realized and paper) gains in the portfolio (as in Odean, 1998). In turn we find the familiar discrepancy in the propensity to sell at a gain versus loss as was first documented by Odean (1998) followed by a sizable literature. Our statistics are in line with the findings in these studies.

[Insert Table 3 about here]

### **2.3 Institutional background of investment tax reform**

Since the 1st of January 2009, private investors in Germany owe capital gains taxes. Before January 2009, capital gains tax were owed only if assets were liquidated within a year after purchase and some special cases whereas dividends and interest were taxed at the personal income tax rate, which could amount up to 42%. The capital gains taxes of stocks and funds bought before 1st of January 2009 remain tax-free up until an initial allowance of 100,000€ but their capital gains since 1st of January 2018 will be taxed beyond that value. For stocks and funds bought after 1st of January 2009, capital gains are taxed at the same rate as dividends and interest payments and the tax is subtracted at the source, i.e., in the event of a capital gains realization, the money that arrive in the client's settlement account after a sale are already after tax funds. Since 2009, the capital gains tax is 25% (Abgeltungsteuer auf Kapitalerträge) plus solidary addition (Solidaritätzuschlag) (5.5% of the capital gains tax) and (if applicable) church tax (Kirchensteuer) (8 or 9% of the capital gains tax) which amounts to approximately 26.375% in total. Furthermore, there is an initial allowance (Freibeträge) of 801€ for singles and 1.602€ for married couples. Individuals can specify their main brokerage such that the capital gains tax will not be subtracted unless the initial allowance is exceeded (Freistellungsauftrag). Furthermore, if capital losses are realized before capital gains, then the capital gains tax will be automatically lowered by the realized losses. Thus, gains and losses are offset with losses exceeding gains either rolled forward or, upon request, being certified to be taken into account in individual tax returns. At the level of the brokerage, the initial allowance is taken into account as well as the initial allowance for funds bought before January 2009. To start

taxing all funds bought before 2009 from their value of January 1, 2018, was one of the two reasons for the fictitious sale but none of our investors are actually affected because the initial allowance is so high (100,000€ for singles and 200,000€ for couples).

Beyond taxing funds bought before 2009, the second goal of the reform on January 1st, 2018, was to simplify the treatment of retaining foreign funds. Previously, retaining foreign funds capital gains as well as dividends had to separately be reported by investors in their individual tax returns (while retaining domestic funds were taxed at the fund level on their retentions and non-retaining domestic and foreign funds were taxed at the investor level). Now, all funds are treated equally and all tax assessments are done automatically without the investor's having to report. On all retaining funds, individuals now have to pay taxes on their retentions at the end of the tax year (Vorabpauschale). To simplify the process of calculating the Vorabpauschale, the online bank as well as many other banks fictitiously bought and sold all fund holdings of all clients on the 1st of January 2018 and reset the purchase price to the December 29 2017 closing price, as quoted by the exchange. This constitutes a change of when taxes are paid for those individuals who hold foreign retaining funds but not their effective tax rate. However, 1) many individuals do not hold foreign retaining funds, 2) many of our individuals do not earn capital gains above the initial tax-free allowance and thus do not have to pay the Vorabpauschale, and 3) the Vorabpauschale is very small, for instance, for purely retaining equity funds in 2018 equal to the German prime interest rate (Basiszins equaling 0.87% in 2018) times 70% times the 1st of January 2018 price of the fund (i.e., 61 basis points).

When individuals log in to their online brokerage, they see the purchase price, the current price, their total holdings, as well as their return since purchase. On January 1st, 2018, the purchase price was set equal to the December 29, 2017, closing price, as quoted by the exchange, and the return was set to 0%. Afterwards, the value developed as usual. Figure 1 shows screenshots of the online portfolio interface that individuals see. The portfolio interface shows all fund and stock holdings as well as their daily absolute change and percentage change, i.e., return. Additionally, to the daily change, the interface shows the absolute change and percentage change, i.e., return, since purchase of the security position. The latter portion got reset on January 1st, 2018, to implement

the capital gains tax reform. Investors were informed via email as well as online upon logging in starting in March 2018. The online notification is also displayed in Figure 1. It can also be seen in the he amount purchased, purchase price, absolute return, and relative return changed on 1st of January 2018 (that are displayed right next to buy and sell buttons). However, the actual purchase prices are only one click on “order summary” away.

If individuals are confused about the tax implications of the reform and think that the new display of capital gains are in some or the other way more tax-relevant, then they should not be more likely to sell at a capital gain than a capital loss. Therefore, the disposition effect in new gain positions would be more surprising or irrational from a tax perspective than in the classic disposition effect literature (Odean, 1998).

### 3 Methodology and identification

#### 3.1 Specifications for trades and consumption

We first run a classic disposition effect regression to determine the effect of how winners and fictitiously changed purchase prices affect trades. For either the whole sample period or only 2018, we regress a sale dummy for either all securities or only funds on whether or not the sold security was a winner, a fictitious winner (i.e., actually a loser relative to the purchase price but at the time of sale displayed as a winner), or a fictitious loser (i.e., actually a winner relative to the purchase price but at the time of sale displayed as a loser):

$$T_j^{it} = \alpha_t + \eta_i + \beta G_j^{it} + \gamma FictG_j^{it} + \theta FictL_j^{it} + \epsilon_j^{it} \quad (1)$$

where  $T_j^{it}$  is a dummy for whether investor  $i$  sold security  $j$  at time  $t$ ,  $\alpha_t$  is a month-by-year fixed effect,  $\eta_i$  is an individual fixed effect,  $G_j^{it}$  is a dummy for whether investor  $i$  could have sold security  $j$  at time  $t$  at a gain relative to the original purchase price,  $FictG_j^{it}$  is a dummy for whether investor  $i$  could have sold security  $j$  at time  $t$  at a gain relative to the new purchase price even though it was a loss at the original purchase price,  $FictL_j^{it}$  is a dummy for whether investor  $i$  could have sold

security  $j$  at time  $t$  at a loss relative to the new purchase price even though it was a gain at the original purchase price. As standard in the disposition-effect literature, the investor  $i$  level variables at time  $t$  are observations whenever investor  $i$  makes any trade at time  $t$ , i.e., we run a regression conditional on individual trading days. Because the repricing event is exogenous to individual investors, other control variables are not necessary but may increase precision. Furthermore, we cluster standard errors at the individual level.

To analyze the effects of fictitious capital gains on consumption, we consider a time-series approach aggregated to the monthly level. The time-series regression is using a panel for each month  $t$  from January 2017 to June 2018 or considering only 2018 as follows:

$$C^{it} = \alpha_t + \eta_i + \beta Liq^{it} + \gamma G^{it} + \theta L^{it} + \vartheta FictG^{it} + \varphi FictL^{it} + \epsilon^{it} \quad (2)$$

We now use the Euro value of consumption as the outcome variable, i.e.,  $C^{it}$  is the Euro value of ATM withdrawals and point of sale transactions (plus wires in additional specifications),  $G^{it}$ ,  $L^{it}$ ,  $FictG^{it}$ , and  $FictL^{it}$  are the capital gains or losses for the liquidated winners or losers before and after January 2018, the fake winners, and the fake losers. Furthermore,  $Liq^{it}$  is the total amount (including the capital gains or losses) that is liquidated by individual  $i$  in month  $t$  minus the reinvestment into the portfolio. The idea here is that within one individual within one month, if he or she liquidates because she wants to consume or because her wealth is higher than his or her consumption amount should not be affected by the values of  $FictG^{it}$  and  $FictL^{it}$  that are just random numbers depending on the price of the fund on December 29 2017 at the end of the day and its performance since. Economic sentiment that could affect both consumption and stock prices is controlled for by the time fixed effects while the decision about how much to liquidate and the wealth considerations are controlled for by the liquidation amount and actual capital gains and losses. We thus argue that the treatment variables  $FictG^{it}$  and  $FictL^{it}$  are exogenous conditional on the controls. Again, because the repricing event is exogenous to individual investors, other control variables are not necessary but may increase precision. As before, we cluster standard errors at the individual level.

Let us explain in a bit more detail how, in this specification, we single out the causal effect of fictitious capital gains that induce individuals to sell and consumption. For that, we spell out what are the omitted variables that are affecting both consumption  $C^{it}$  and also fictitious capital gains  $FictG^{it}$  and would lead to a spurious correlation rather than a causal relationship in Specification 2.

We are concerned about three types of omitted variables: time, consumption plans or preference shocks, and wealth shocks. First, there is time and aggregate variables that drive both consumption and fictitious capital gains in 2018 (say, economic sentiment). We control directly for any aggregate variables correlated with time using the month-by-year fixed effects  $\alpha_t$ . Second, there are individual consumption plans or shocks to individual preferences. More specifically, there is the decision to liquidate, call that  $ILiq^{it}$  and then the amount that is liquidated, which we denoted by  $L^{it}$ . The decision to liquidate is clearly correlated with the liquidated fictitious capital gains that equal  $FictG^{it} = ILiq^{it} * UFictG^{it}$  if  $UFictG^{it}$  denotes unrealized fictitious capital gains. However, we control for it directly by controlling for  $L^{it} = ILiq^{it} * (UG^{it} + InvL^{it} - ReInvL^{it})$  if  $UG^{it} + InvL^{it} - ReInvL^{it}$  equal the unrealized capital gains plus the initial investment amount minus the reinvested amount upon liquidation. In contrast to the decision to liquidate, the amount liquidated should not be correlated with aggregate fluctuations in the stock market, but still we control for that directly by  $L^{it}$ . Third, we may worry about wealth shocks that affect consumption and individual capital gains are correlated with fictitious capital gains of course. However, again we control for realized capital gains directly via  $G^{it} = ILiq^{it} * UG^{it}$  or, in the event of capital losses,  $L^{it}$ .

The omitted variable bias theorem tells us that when we run a regression of the form  $Y = \beta X + \epsilon$  and if a variable  $Z$  (in our case, the decision to liquidate plus how much) affects both  $X$  and  $Y$  then  $\beta$  is biased, but  $\beta$  is unbiased if we control for  $Z$  in the regression  $Y = \beta X + \rho Z + \epsilon$ , which is exactly what we do here. We thus single out a causal effect of fictitious capital gains and consumption by controlling for the omitted variables directly. Furthermore, let us point out again that we control directly for these omitted variables, i.e., we do not use proxies or measure the omitted variables with any measurement error.

When investors make a trade or a position gets liquidated, then there occurs a transfer to

the settlement account (Verrechnungskonto). The settlement account is an account dedicated for making trades and automatically opened when individuals open a portfolio. It pays some interest and is federally insured. For consumption, we thus consider the following outcome variables: 1) ATM withdrawals plus point of sale transactions, i.e., individuals swipe their card in the store or purchase goods or services online entering their card information, 2) measure 1) in addition to wire transfers that leave the bank, and 3) measure 2) in addition to all other outflows that leave the bank. All the variables are transfers and thus flow variables. The coefficient in the consumption regression can thus be interpreted as the marginal propensity to consume out of one dollar of realized capital gains or losses when the security was a fictitious winner or loser. We argue that it is unlikely that individuals have a second brokerage account or additional savings vehicles as banking with multiple banks is discouraged in the German credit score system. Furthermore, individuals want to dedicate one brokerage account as their main one to receive the tax-free allowance of capital gains. Additionally, we have a flag of the bank indicating customers without other banking relationships.

## 4 Results

### 4.1 Empirical results

Columns 1 and 2 of Table 4 show the estimation results for the probability that either all securities or only funds are sold when they are displayed as winners for the full sample period. We can see that individuals are subject to the disposition effect, over the whole sample and all securities, the likelihood of sale is approximately 10 percent higher when the security is trading at a gain relative to the original purchase price. Here, we simply replicate the findings in Koestner et al. (2017). When we only include funds, we obtain a less strong disposition effect: individuals are sometimes more likely to sell a winning fund but sometimes less to do so. This result is in line with the findings in Chang et al. (2016) who document a significant reverse disposition effect for funds, which we do not find consistently in our sample. The disposition effect is considered as difficult to rationalize with efficient markets and rational expectations because of the following: in principle, the decision to sell should only be affected by expectations about future returns and those should be incorporated into

stock prices. In contrast, the decision to sell should not be affected by whether or not the investor made a gain relative to their initial investment or a loss.

More importantly columns 3 and 4 of Table 4 show the estimation results for the probability that funds are sold when they are either winners relative to their original purchase prices, or are displayed as winners after 1st of January 2018, even though they are actually losers, or are displayed as losers after 1st of January 2018 even though they are actually winners. We can see that individuals are subject to the disposition effect with respect to the fictitious winners and losers, they are almost 4 percent more likely to sell a fictitious winner and almost 1 percent less likely to sell a fictitious loser. The effect of fake losers is attenuated possible because of selective inattention, i.e., individuals are happy to learn that a loser is now a winner but they get suspicious when a former winner is now displayed as a loser. Furthermore, in the literature using the data in Odean (1998) it is well known that the disposition effect mainly manifests in selling winners.

[Insert Table 4 about here]

Furthermore, Table 6 shows the same estimation results for the amount consumed, using different measures of consumption, on liquidated fake capital gains or losses. We either run the regression using the sample period January 2017 to June 2018 or only including 2018. We find that individuals typically only consume a small fraction out of their liquidations, however, fictitious capital gains have a large effect. Approximately 20 to 40 percent is consumed out of a fictitious capital gain that is liquidated. For fictitious capital losses again the effect is attenuated. We find such a large consumption response potentially because the absolute and relative capital gain is very salient to investors when selling the fund (as opposed to the actual capital gain and the actual liquidation amount which is only stated in the sales receipt the individuals receive after the sale has been processed by the clearing house and the bank subtracted all fees and taxes). Right next to the sell button, the fictitious capital gain is displayed in both Euros as well as in percentage terms.

[Insert Table 6 about here]

## 4.2 Robustness

As robustness checks, we can All robustness checks can be found in Table 5. In Table 5 column 1 we include individual fixed effects and month-by-year fixed effects. Column 2 has additionally fund fixed effects. In the latter case, we additionally control for all time-invariant effects at the fund level. Furthermore, in Table 7, we show the consumption regressions for only individuals that the bank flagged as main customers, i.e., clients without any other banking relationships. As expected, the effects become even stronger for this subset of individuals. After all, some individuals may not do any ATM withdrawals or point-of-sale transactions with this bank as they do not use the checking account as their main checking account.

[Insert Tables 5 and 7 about here]

## 4.3 Placebo tests

As placebo tests, we can run the exact same regressions for either non-funds in 2018, as no fictitious sale happened there, or funds but using the data from January to June 2017, when no fictitious sale happened. All placebo checks can be found in Tables 8 to 10. In Table 8 column 1 we look at 2018 but use non-funds securities and their placebo fictitious gains and losses. Column 2, instead, uses funds but the data up until June 2017 and the placebo fictitious gains and losses. In turn, the next columns add individual and month-by-year fixed effects. Overall, we also find significant effects, however, the coefficients are cut by about half and significantly smaller. In the data of Odean (1998), it is well known that there is also a recency effect: individuals tend to sell securities that performed well recently.

We can clearly see that the recency placebo effects we document are statistically significantly smaller than the effects of fictitious winners in 2018. Nevertheless, to single out the difference in one specification, we run a regression using data from January to June in 2017 and 2018. In turn, we include fictitious capital gains and losses either the actual ones or the placebo ones in one variable. Finally, we include a dummy for funds in 2018 and document the interaction coefficient of this dummy and the (placebo) fictitious capital gains. This is done in Table 11 and we can see that the

interaction effect is large and statistically significant at approximately 2%.

Furthermore, in Table 9, we show the consumption regressions for data up to June 2017 instead of 2018. In turn, in Table we do the same but only for individuals that the bank flagged as main customers, i.e., clients without any other banking relationships. As expected, the effects of fictitious capital gains and losses are insignificant and small.

[Insert Tables 8 to 10 about here]

## 5 Conclusion

Using a large sample of transaction-level data on all asset holdings, spending, and income from a German retail bank, this paper explores how the individual propensity to sell winners and hold on to losers as well as individual consumption responds to an exogenous reset in the displayed purchase price of funds and thereby their displayed returns as well as capital gains and losses. Our identification strategy exploits the implementation of a capital gains tax reform that facilitated the online bank's assessment of capital gains taxes and their subtraction at the source. We find that individuals react to fictitious winners and losers in their likelihood of selling. Furthermore, we document that this fictitious disposition effect has real consequences in affecting consumption beyond just trading.

As a contribution to the literature on the disposition effect, we provide causal evidence for a preference for realizing winners as opposed to losers following Frydman and Wang (fthc) who analyze the salience of new price variables and their color in online portfolios. Documenting the causal effect of fake winners on trading is evidence for an inherent preference for realizing winners contrary to other explanations of the disposition effect such as speculation motives (Ben-David and Hirshleifer, 2012). Furthermore, it is additional evidence against the ideas that retail investors follow optimal trading strategies or act in tax-efficient manners. Additionally, we provide evidence that reference points are set by displayed prices, for which, to the best of our knowledge, only experimental evidence exists (Frydman and Rangel, 2014). What we think is the most novel contribution is documenting the real consumption effects of the disposition to hold on to losers: to the best of

our knowledge, no paper links the disposition effect to consumption. Furthermore, documenting that fictitious capital gains and reference points affect consumption is relevant for the literature on mental accounting as well more generally on stock market wealth and consumption.

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Name	Stück/Nominal	amount purchased		Kurs	Gesamtwert	Aktion
		Einstandskurs inkl. NK	Einstandswert			
WKN		Veränderung Intraday	price	Handelsplatz	Entwicklung prozentual	relative return
VANG.GBL MO.AC.U.ETF DL	33,00	26,969394 EUR		27,305 EUR	901,06 EUR	Details
A14YC0		889,99 EUR		16.11.18 22:25:45	+11,08 EUR	Kaufen
ETF		-0,49 %		Tradegate	+1,24 %	Verkaufen
<b>Gesamtdepotwert</b>					<b>901,06 EUR</b>	

**Investmentsteuerreform**

Aufgrund der Investmentsteuerreform erhalten Ihre Fondsbestände zum 01.01.2018 neue Einstandskurse. Dadurch ändert sich Ihre Wertentwicklung. Die Umstellung ist voraussichtlich bis Anfang März 2018 abgeschlossen. In diesem Zeitraum treten eventuell Verzögerungen bei Ihren Verkaufsabrechnungen für Fonds auf. Über den Gegenwert Ihrer Fondsverkäufe können Sie im Rahmen von Neugeschäften verfügen. Externe Überweisungen des Verkaufserlöses sind ggf. nur telefonisch möglich. Die ursprünglichen Einstandskurse und Ihre Wertentwicklung zum 31.12.2017 werden Ihnen spätestens im 1. Quartal 2018 im Online-Archiv bereitgestellt.

Weitere Informationen

Diesen Hinweis nicht mehr anzeigen

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Figure 1: Screenshots of the bank's portfolio interface and notification of the repricings due to the capital gains tax reform

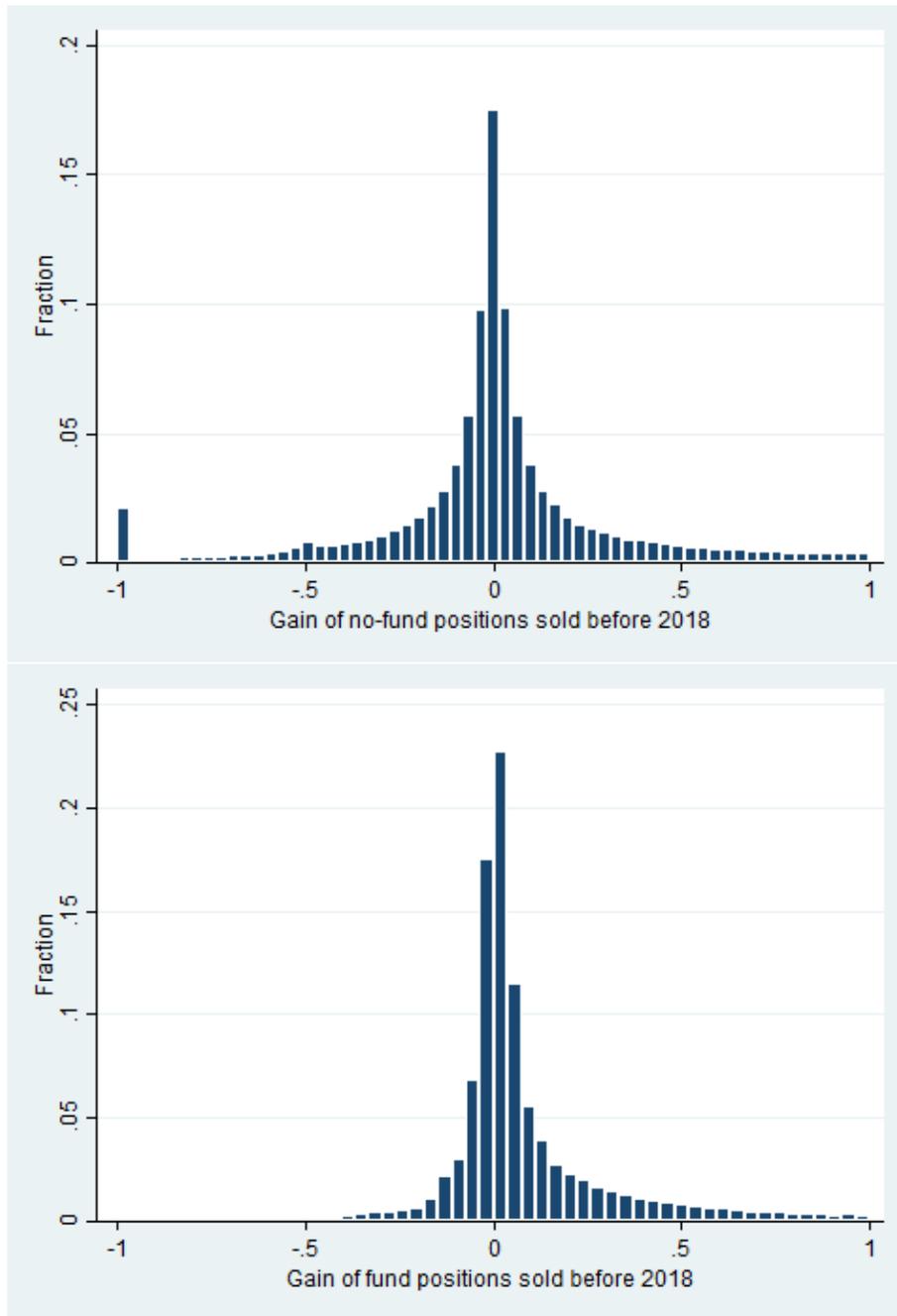


Figure 2: Distribution of individual positions sold in all other securities and all funds before 2018

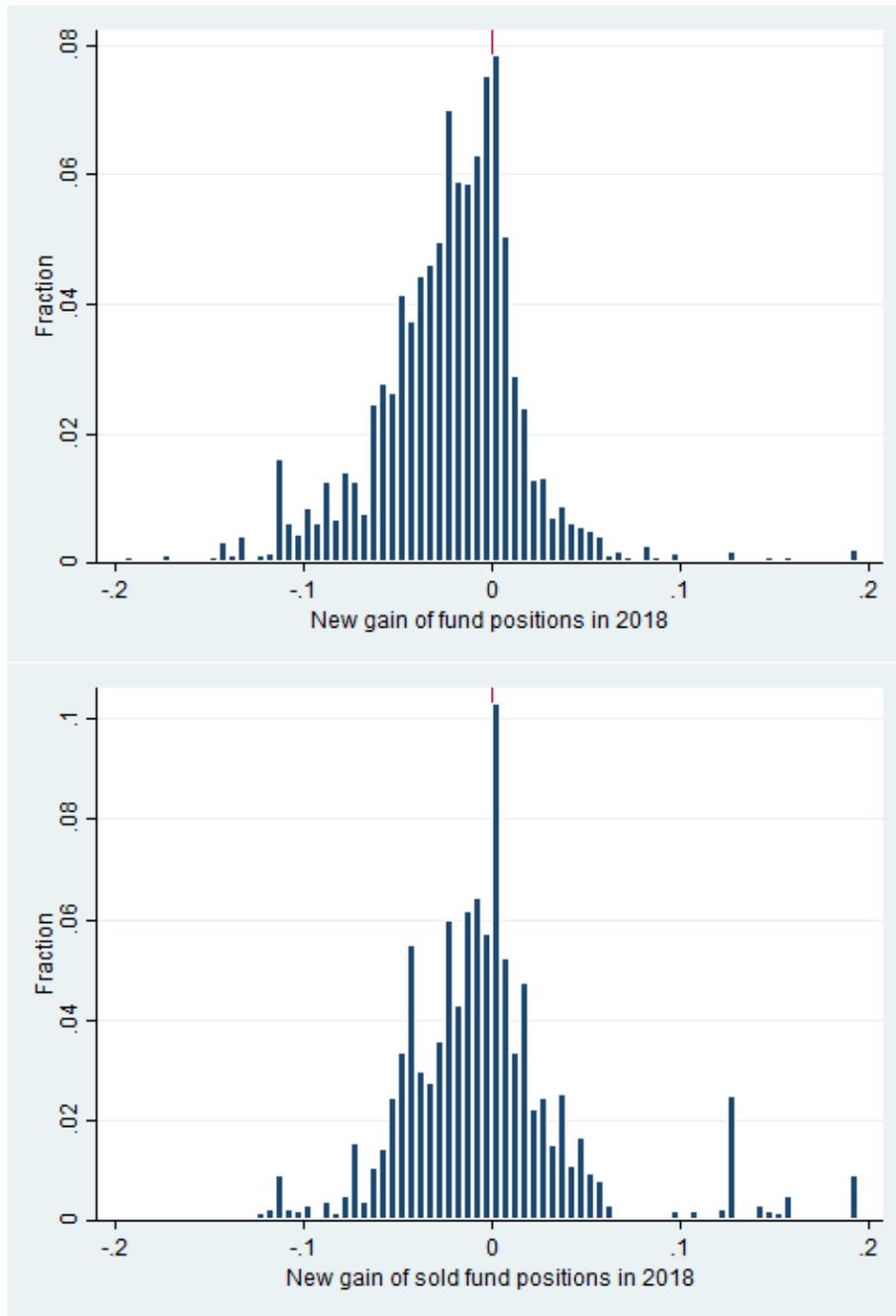


Figure 3: Distribution of the individual positions sold in all other securities and all funds before 2018

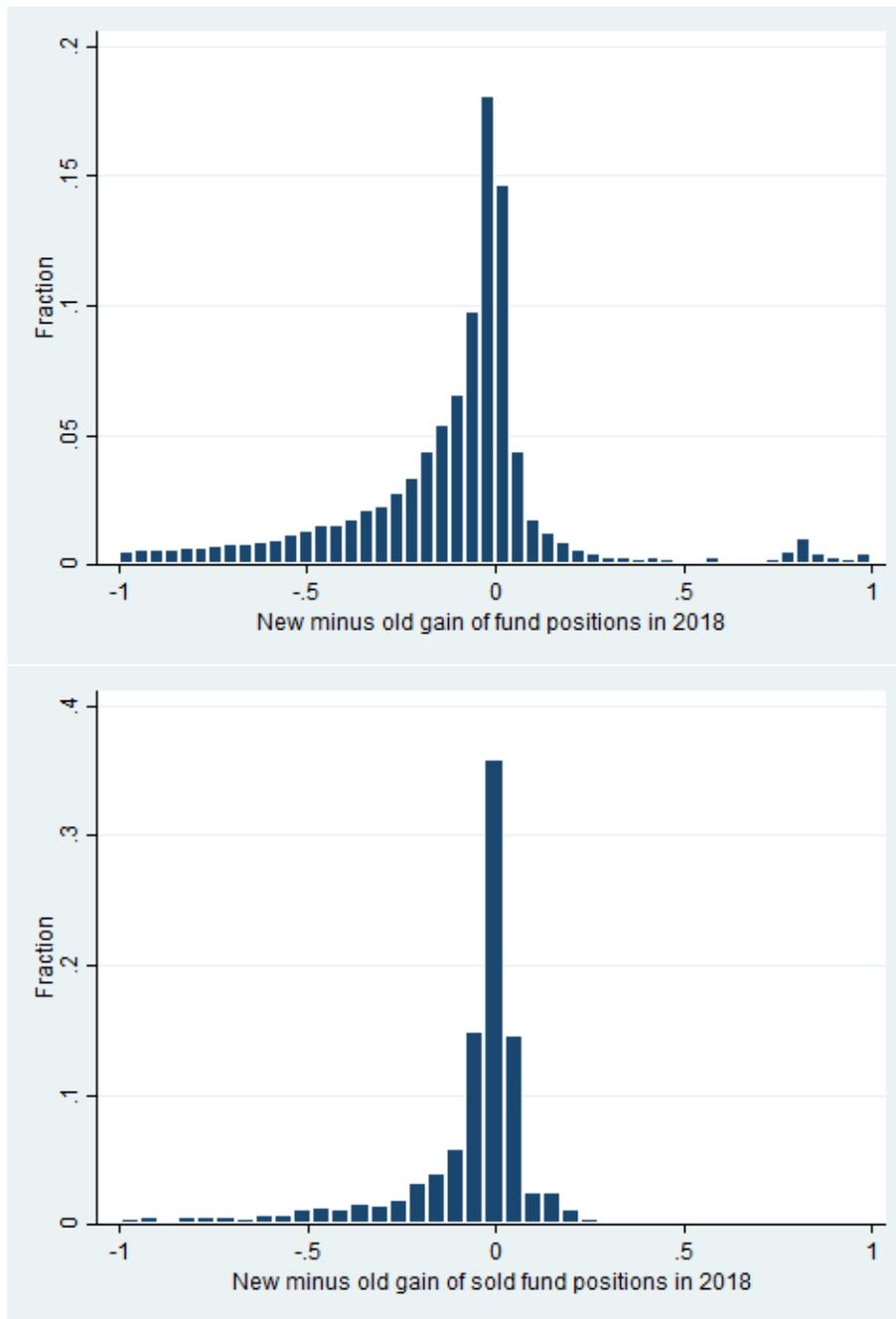


Figure 4: Distribution of the change in the displayed returns in individual fund positions, first all positions and second all sold positions

Table 1: Summary statistics for all investors

	mean	standard deviation	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile
male	.84	.37	0	1	1	1	1
age	54	13	40	45	52	61	72
PhD educated	.078	.27	0	0	0	0	0
account tenure (in years)	13	3.3	11	11	11	14	19
risk class	3.5	1.5	1	3	4	5	5
wealth	51,148	93,079	5,000	20,000	45,000	45,000	175,000
income	54,642	24,673	30,000	30,000	50,000	80,000	80,000
number of purchases	145	488	3	12	39	116	322
number of sales	124	434	7	15	36	101	264
risk class of trades	4.4	1.5	3.6	3.9	4.2	4.6	5
portfolio value	55,836	129,607	7,425	16,577	33,586	62,808	111,841
number of securities	46	30	8.6	20	41	68	92
HH index	.14	.15	.0083	.037	.095	.2	.35

Notes: Wealth, income, and risk aversion are self-reported statistics in brackets. Number of purchases and sales are the sum over the entire sample period. Number of securities is 100 for funds. HH index is the Herfindahl-Hirschman index measure of diversification ranging from 0 to 1.

Table 2: Descriptive statistics for bought and sold or kept securities

		2018	2018	2017	2017
		sale	no sale	sale	no sale
mean purchase price	funds	166.2515	168.3037	145.463	162.0448
	other	83.8662	74.21379	82.16725	70.59283
mean sale price	funds	200.5661	179.2656	181.5706	166.9038
	other	94.4203	75.14161	90.53336	68.37906
size of trade	funds	7152.012	9355.071	7446.56	10617.7
	other	9887.039	7857.634	10046.56	7976.391
price end 2017	funds	200.9642	172.5608		

Table 3: Propensity of gains realized versus propensity of losses realized as in Odean (1998)

	observations	mean	standard deviation	25th percentile	75th percentile
PGR: propensity of gains realized	37131	0.127659	0.1505687	0.0454545	0.1478873
PLR: propensity of losses realized	37184	0.07703	0.1310168	0.0201613	0.0769231
PGR minus PGL	36843	0.0500828	0.1477532	0.0037547	0.0824925

Table 4: Estimation results of probability of sale on dummies for the security of being a winner, a fictitious winner, or a fictitious loser

	all securities full sample	funds full sample	funds 2018	funds 2018
	sale	sale	sale	sale
gain	0.0607*** (0.000808)	-0.00312*** (0.000732)	0.00771*** (0.00198)	0.00797*** (0.00197)
fictitious gain			0.0409*** (0.00408)	0.0426*** (0.00407)
fictitious loss			-0.00824*** (0.00211)	-0.00463** (0.00198)
individual fixed effects			✓	
month-by-year fixed effects				✓
observations	52,619,347	7,317,370	147,762	147,762
R squared	0.019	0.003	0.261	0.092

Standard errors (clustered at the individual level) in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5: Estimation results of probability of sale on dummies for the security of being a winner, a fictitious winner, or a fictitious loser

	2018	2018
	sale	sale
gain	0.00797*** (0.00186)	-0.00341 (0.00251)
fictitious gain	0.0426*** (0.00383)	0.0506*** (0.00456)
fictitious loss	-0.00463** (0.00186)	-1.49e-06 (0.00217)
month-by-year fixed effects	✓	✓
individual fixed effects	✓	✓
funds fixed effects		✓
observations	123,836	123,383
R squared	0.234	0.278

Standard errors (clustered at the individual level) in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6: Estimation results of different measures of consumption on liquidation amounts less reinvestment of all securities, capital gains, fictitious capital gains, and fictitious capital losses

	all securities full sample	2018	all securities full sample	2018
	ATM + POS in €	ATM + POS in €	ATM + POS + wires in €	ATM + POS + wires in €
fictitious gain in €	0.380** (0.148)	0.432** (0.180)	0.245** (0.0993)	0.283** (0.123)
fictitious loss in €	-0.000320 (0.000205)	-0.000715 (0.000716)	-0.000282 (0.000175)	-0.000622 (0.000631)
gain in €	✓	✓	✓	✓
loss in €	✓	✓	✓	✓
liquidation minus reinvestment in €	✓	✓	✓	✓
individual fixed effects	✓	✓	✓	✓
month-by-year fixed effects	✓	✓	✓	✓
observations	609,693	216,513	609,693	216,513
R squared	0.151	0.415	0.135	0.403

Standard errors (clustered at the individual level) in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 7: Estimation results of different measures of consumption on liquidation amounts less reinvestment of all securities, capital gains, fictitious capital gains, and fictitious capital losses for the subsample of main customers

	all securities full sample	2018	all securities full sample	2018
	ATM + POS in €	ATM + POS in €	ATM + POS + wires in €	ATM + POS + wires in €
fictitious gain in €	0.738** (0.335)	0.852** (0.421)	0.490** (0.230)	0.582** (0.288)
fictitious loss in €	-0.00139* (0.000755)	-0.000627 (0.000725)	-0.00122* (0.000643)	-0.000551 (0.000638)
gain in €	✓	✓	✓	✓
loss in €	✓	✓	✓	✓
liquidation minus reinvestment in €	✓	✓	✓	✓
individual fixed effects	✓	✓	✓	✓
month-by-year fixed effects	✓	✓	✓	✓
observations	141,442	50,776	141,442	50,776
R squared	0.136	0.366	0.122	0.349

Standard errors (clustered at the individual level) in parentheses \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 8: Placebo estimation results of probability of sale on dummies for the security (non-funds in 2017 or 2018 or funds in 2017) of being a winner, a fictitious winner, or a fictitious loser

	non-funds 2018	non-funds 2017	funds 2017	funds 2017	funds 2017
	sale	sale	sale	sale	sale
gain	0.0173*** (0.000700)	0.0147*** (0.000802)	0.00203 (0.00326)	0.000436 (0.00327)	-0.0150*** (0.00376)
fictitious gain	0.0180*** (0.00108)	0.0155*** (0.00102)	0.0210*** (0.00387)	0.0191*** (0.00398)	0.0124*** (0.00406)
fictitious loss	0.000342 (0.000759)	0.00247*** (0.000783)	-0.00479* (0.00283)	-0.00563** (0.00287)	-0.00457* (0.00273)
individual fixed effects	✓	✓	✓	✓	✓
month-by-year fixed effects				✓	✓
funds fixed effects					✓
observations	1,178,397	1,177,202	146,261	146,261	143,306
R squared	0.098	0.106	0.254	0.254	0.254

Standard errors (clustered at the individual level) in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 9: Placebo estimation results of different measures of consumption on liquidation amounts less reinvestment of all securities, capital gains, fictitious capital gains, and fictitious capital losses in 2017

	all securities full sample until June 2017	2017	all securities full sample until June 2017	2017
	ATM + POS in €	ATM + POS in €	ATM + POS + wires in €	ATM + POS + wires in €
fictitious gain in €	0.00856 (0.00643)	0.00857 (0.00740)	0.0178 (0.0140)	0.0179 (0.0159)
fictitious loss in €	8.21e-05** (4.19e-05)	0.00233 (0.00175)	3.31e-05 (7.31e-05)	0.00526*** (0.00195)
gain in €	✓	✓	✓	✓
loss in €	✓	✓	✓	✓
liquidation minus reinvestment in €	✓	✓	✓	✓
individual fixed effects	✓	✓	✓	✓
month-by-year fixed effects	✓	✓	✓	✓
observations	546,290	168,447	546,290	168,447
R squared	0.312	0.472	0.254	0.408

Standard errors (clustered at the individual level) in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 10: Placebo estimation results of different measures of consumption on liquidation amounts less reinvestment of all securities, capital gains, fictitious capital gains, and fictitious capital losses for the subsample of main customers

	all securities full sample until June 2017	2017	all securities full sample until June 2017	2017
	ATM + POS in €	ATM + POS in €	ATM + POS + wires in €	ATM + POS + wires in €
fictitious gain in €	0.00854 (0.00720)	0.00731 (0.00795)	0.0166 (0.0145)	0.0163 (0.0174)
fictitious loss in €	-0.000599 (0.000657)	-0.00443** (0.00225)	-0.000988** (0.000500)	-0.00304 (0.00327)
gain in €	✓	✓	✓	✓
loss in €	✓	✓	✓	✓
liquidation minus reinvestment in €	✓	✓	✓	✓
individual fixed effects	✓	✓	✓	✓
month-by-year fixed effects	✓	✓	✓	✓
observations	112,537	34,259	112,537	34,259
R squared	0.353	0.532	0.215	0.373

Standard errors (clustered at the individual level) in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 11: Estimation results of probability of sale on dummies for the security (2017 and 2018 January to June) of being a winner, a (placebo) fictitious winner, or a (placebo) fictitious loser interacted with a dummy for a fund sale in 2018

	funds 2017 and 2018	all securities 2017 and 2018
	sale	sale
gain	0.0118*** (0.00247)	0.0225*** (0.000691)
fictitious gain	0.0332*** (0.00345)	0.0236*** (0.000978)
fictitious loss	0.000818 (0.00258)	0.00624*** (0.000758)
fictitious gain 2018	0.0405*** (0.00264)	0.0298*** (0.000802)
fictitious loss 2018	-0.00985*** (0.00261)	-0.0149*** (0.000994)
individual fixed effects	✓	✓
observations	272,510	2,355,599
R squared	0.216	0.084

Standard errors (clustered at the individual level) in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1