Reinvesting Dividends*

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Abstract

It is a long-standing fact that retail investors largely consume dividends with previous studies estimating consumption rates of up to 75%. Using six different datasets, we show that dividend consumption rates have decreased substantially over time to less than 20%, today. Instead of consumption, we find reinvestments into securities portfolios of up to 80%. We provide evidence that this time trend is driven by the transition from checks to direct deposits for the payout of dividends. While it was easy and tempting to spend dividend checks in the past, today's dividends sit in brokerage cash positions, waiting to be reinvested.

Keywords: dividend reinvestment, brokerage cash, choice architecture, mental accounting, default effects, retail investors, household finance

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Say, one of your stocks pays a USD 500 dividend. Imagine the USD 500 are mailed to you as a check. What would you do? Now, imagine the USD 500 are directly deposited into your brokerage cash balance. What would you do then?

It is a long-standing fact that retail investors mostly consume dividends and rarely reinvest them. In the seminal study on this topic, Baker, Nagel, and Wurgler (2007) analyze the Consumer Expenditure Survey from 1988 until 2001 and find dividend consumption rates of up to 75%. Additionally, the authors analyze a US brokerage dataset from 1991 until 1996 and estimate that only 18% of ordinary dividends are reinvested. Similarly, Di Maggio, Kermani, and Majlesi (2020) estimate annual dividend consumption (reinvestment) rates as high as 60% (as low as 20%) in an administrative dataset of Swedish households from 1999 until 2007. These estimates of long-run dividends uses are complemented by analyses of short-term responses to dividends. Kaustia and Rantapuska (2012) find that only up to 15% of dividends are reinvested two weeks after payment by Finnish retail investors from 1995 until 2002. Similarly, Bräuer, Hackethal, and Hanspal (2022) find that 14% (9%) of dividends are consumed (reinvested) one week after payment by clients of a German online bank from 2017 until 2019.

In this study, we also analyze the Consumer Expenditure Survey (CEX) and replicate the 75% dividend consumption rate that Baker, Nagel, and Wurgler (2007) find from 1988 until 2001. Yet, when we extend the analyses to CEX data beyond 2001, we find a strong decline in the dividend consumption rate. Until 2012 (the last year in which the CEX contains a separate variable for dividends), we estimate that dividend consumption declines to 26%. The consumption rate for dividends plus interest (for which data is available until 2022), declines from 57% in 1988 to only 6% in 2022. Moreover, we identify a subset of households in the CEX that already have a low dividend consumption rate around 1990: early adopters of computers. Why did the dividend consumption rate decline so strongly over time? Why do early adopters of computers precede other

households in having a low dividend consumption rate? And what do households do with their dividends if they do not consume them?

As a mechanism that provides answers to these questions and ties together our results with those of previous studies, we explore the interaction of mental accounting and default effects with the dividend payment method and the structure of the brokerage account. Mental accounting and default effects are the two leading explanations for high dividend consumption rates and low reinvestment rates (Baker, Nagel, and Wurgler 2007; Kaustia and Rantapuska 2012; Di Maggio, Kermani, and Majlesi 2020; Bräuer, Hackethal, and Hanspal 2022).[1] Investors that engage in mental accounting have a separate mental account for dividends from which they allow themselves to consume to avoid overspending from their capital (Shefrin and Statman 1984; Shefrin and Thaler 1988). Investors that are prone to default effects simply fail to reinvest dividends due to inertia (Samuelson and Zeckhauser 1988; Kaustia and Rantapuska 2012). Both models depend on the mental and physical processing of dividend payments by investors. What happens to this processing when the modalities of the dividend payment change?

Historically, dividends were usually sent to investors as checks in the mail. Checks could easily be earmarked for consumption *mentally* and the most convenient way to deal with checks *physically* was to deposit them into the checking account from where the proceeds were easily spent. However, this is no longer the case. Today, dividends are usually directly deposited into investors' brokerage accounts where they are added to "brokerage cash positions". In the mix with other investment-related funds, dividends are hard to earmark *mentally* and the most convenient way to deal with brokerage cash *physically* is to use it for future investments.[2] Yet, not all dividends are paid out to such

[1] A consumption rate that is significantly higher for dividends than for capital gains (which the previous studies find), cannot be explained with classical rational theories of consumption choice as the dividend payment itself does not affect investor wealth. Therefore, explanations generally resort to models of bounded rationality.

[2] Brokerage cash positions usually lack payment features and proceeds would have to be transferred to another bank account before they can be spent. The behavioral sciences literature (e.g., Thaler and Sunstein 2021) routinely shows that even seemingly small steps, as those involved in making a bank transfer, are sufficient to cause inertia.

brokerage cash positions, today. Depending on investors' account structure (which often depends on the institutional framework), it is also possible that dividends are directly deposited into bank accounts with payment features, such as checking accounts. From checking accounts, dividends can easily be spent in a planned way and dividends may also be consumed by default if the account is used for day-to-day spending.

Using data from the Survey of Consumer Finances (SCF) from 1989 until 2022, we explore how time trends in dividend payout modalities line up with time trends in dividend consumption. Mirroring the strong decrease in dividend consumption in the 2000s in the CEX, we find a strong increase in the use of direct deposits of investment income in the 2000s in the SCF. Mirroring the already low consumption rates among CEX households who are early adopters of computers in the 1990s, we find already high rates of directly deposited investment income among SCF households who use online brokerage services in the 1990s. Moreover, we analyze the SCF with respect to account structure. In 2022, only 30% of brokerage accounts are at an institution where the household has a checking account or credit card. This means (given that dividends are rarely paid out by check in 2022), that 70% of households receive their dividends on an account from which it is inconvenient to spend dividends but convenient to reinvest them. Additionally, we show that households rarely interact with their broker in a way that would enable the spending of dividends. In 2013 (the last year in which interactions are recorded in the SCF), only 43% of households make payments or withdrawals from any account that they have at their broker, implying an upper bound of 43% for the dividend consumption rate.

To investigate what investors do with dividends if they do not consume them, we use brokerage data from a German online bank from 2007 until 2011. At the bank, accounts generally come with a brokerage cash balance to which dividends are paid and which we can observe. Therefore, the account structure is representative for modern brokerage accounts. We find that 80% of dividends are reinvested in securities portfolios, while only

12% are withdrawn from brokerage accounts for consumption. How does this reinvestment come about? Our mechanism predicts that reinvestment occurs *implicitly* in the course of investors' regular trading activity. Instead of making an explicit reinvestment-dedicated buy order in the amount of the dividend, investors implicitly reinvest dividends by adjusting the order size of trades that the investors would have made regardless of the dividend payment. We provide five pieces of evidence for implicit reinvestment. First, reinvestment occurs with a delay. In the month of payment, only 15% of dividends are reinvested. The remainder is parked in the brokerage cash balance and reinvested over the course of the following year. Second, we show that reinvestment activity is highest during months in which trading activity is generally high. Third, we estimate that more than half of reinvestment stems from substitutions of sales with dividend proceeds, not from increased purchases. Fourth, we examine dividend initiations as passive shocks to investors' dividend income. While we do find a significant increase in investments, we do not find a significant increase in the number of purchases after an investor receives a large, newly initiated dividend. Fifth, in line with Kaustia and Rantapuska (2012) and Hartzmark and Solomon (2019), we detect no significant reinvestment back into the dividend-paying position, suggesting that investors do not associate dividend proceeds with the dividend-paying position upon reinvestment.

To provide further modern-day evidence, we conduct an online survey among stock market investors in Germany and the US in 2022. The survey serves three main purposes. First, we investigate the prevalence of different account structures among retail investors. In the survey, 71% (29%) of participants respond that their brokerage account has brokerage cash (is linked to their checking account). Second, following recent studies that directly ask investors about their investment behavior (e.g., Choi and Robertson 2020; Chinco, Hartzmark, and Sussman 2022), we use the survey to produce additional estimates on dividend uses. In the survey, 76% of participants report that they have

primarily reinvested their dividends in the past, 11% that they have spent them, and 13% that they left them in the bank as cash. Third, we gain further evidence on the relation between account structure and dividend uses. In line with our mechanism, we find more consumption and less reinvestment among participants whose brokerage account is directly linked to their checking account.

Finally, we reconcile our results with previous studies. Previous studies (Baker, Nagel, and Wurgler 2007; Kaustia and Rantapuska 2012; Di Maggio, Kermani, and Majlesi 2020; Bräuer, Hackethal, and Hanspal 2022) estimate dividend consumption (reinvestment) rates between 50% and 75% (20% and 30%). Taken together, our evidence suggests that consumption (reinvestment) rates are between 10% and 20% (70% and 80%) for average retail investors, today. Where do these substantial differences come from?

First, we show that data limitations and methodological considerations help explain differences in relation to the analysis of the US brokerage dataset by Baker, Nagel, and Wurgler (2007). On the one hand, brokerage cash positions are not observable in the US dataset, although accounts at this broker have such positions.[3] Therefore, it is not possible to tell whether uninvested dividends are consumed or accumulate as cash. In our German brokerage dataset, we can observe cash positions and find that uninvested dividends generally accumulate as cash. On the other hand, we show that the low reinvestment rates that Baker, Nagel, and Wurgler (2007) estimate in the US brokerage dataset may be driven by the regression design which does not control for cross-sectional differences between investors. By re-running the regressions with controls for investor characteristics, we find high dividend reinvestment rates in the US brokerage dataset.

Second, we show that dividend consumption in Di Maggio, Kermani, and Majlesi (2020) may be overestimated due to a bias in imputed consumption. The authors analyze an administrative dataset of Swedish households in which small bank accounts are

[3]We thank Terry Odean for corresponding with us about this matter.

systematically not observed. To the extent that dividends remain in unobserved bank accounts, the imputation of consumption as the difference between income and savings may confuse dividends in bank accounts with consumed dividends. To estimate the degree of the resulting bias, we carefully calibrate a simulation based on wealth data from Di Maggio, Kermani, and Majlesi (2020) and observed cash balances from our German brokerage dataset. We find that dividend consumption rates in Di Maggio, Kermani, and Majlesi (2020) may be overstated by up to 40 percentage points.

Third, in relation to studies investigating short-term responses to dividends (Kaustia and Rantapuska 2012; Bräuer, Hackethal, and Hanspal 2022), we find similarly low reinvestment rates in the month of payment. That reinvestment rates might increase over the long run is not inconsistent with these studies but even suggested (although not investigated) by their authors: "investors could of course just let their dividends accumulate, and invest at a later time, perhaps annually" (Kaustia and Rantapuska 2012, p. 2367).

Fourth, our mechanism helps explain differences in relation to studies in which investors are faced with different dividend payment methods or account structures. On the one hand, we show that payment methods have changed over time which helps explain differences to Baker, Nagel, and Wurgler (2007) and Di Maggio, Kermani, and Majlesi (2020) who study datasets from the 1980s until the 2000s. On the other hand, account structures are still heterogeneous today which helps explain differences to Bräuer, Hackethal, and Hanspal (2022). The authors study a dataset in which dividends are directly paid out to checking accounts. In line with this account structure facilitating an easy spending of dividends, the authors find significant immediate consumption out of dividends (14% one week after payment).[4]

[4]This is also consistent with higher withdrawal rates (lower reinvestment rates) that we estimate for a small group of 25 investors that have dividends directly paid out to their checking accounts in our German brokerage dataset. This is possible if investors have a checking account at the bank and opt out of brokerage cash. To address endogeneity concerns regarding the causal effect of account structure on dividend uses, we use another feature of our dataset. For dividends of selected mutual funds, the bank offers an automatic reinvestment plan. If investors with directly linked checking accounts chose their account structure due to a preference for consuming dividends, we would expect such investors to not use the reinvestment plan. Yet, our results show that 90% of investors with directly linked checking accounts use the plan (similar

While our estimates of dividends uses differ from previous studies that analyze brokerage and administrative data, our estimates are in line with previous survey evidence. Dong, Robinson, and Veld (2005) survey a Dutch household panel in 2002 and find that 48% of panelists reinvest dividends, 39% leave dividends in the bank, and 13% consume them. Schultz (2023) surveys a Dutch household panel in 2022 and finds that 91% of panelists reinvest or save dividends and 9% consume them. Bräuer, Hackethal, and Hanspal (2022) survey a subsample of their German brokerage clients in 2019 and find that 52% reinvested or saved their last dividend, 30% did nothing specific with it, and 17% consumed it. The fact that previous survey evidence does not support the idea that dividends are largely consumed and rarely reinvested has received surprisingly little attention.

In a broader context, our work is related to studies that quantify consumption and reinvestment rates of forced realizations other than dividends paid by securities. Our mechanism helps reconcile results that previously seemed contradictory. On the one hand, Meyer, Pagel, and Previtero (2020) and Meyer and Pagel (2022) study mutual fund liquidations in a dataset in which proceeds are paid out to brokerage cash balances. In line with our estimates for dividends in such a setting, the authors estimate a low consumption rate of 11% and a high reinvestment rate of 82% for liquidation proceeds. On the other hand, Kueng (2018) studies the Alaskan Permanent Fund Dividend which is a yearly payout to Alaskan residents. By choice of the resident, the payout is either made via check or direct deposit into a bank account of the resident's choice (e.g., a checking account). In line with our mechanism, the author finds high consumption rates (25% for nondurable expenditures and up to 73% for total expenditures).

This study contributes to research on how the design of financial products interacts with human behavioral traits in producing financial outcomes and how these outcomes

to the 92% of other investors who use it). Therefore, account structure does not seem to follow dividend consumption preferences (besides, such endogeneity concerns would also be difficult to reconcile with our results from the *representative* CEX data).

change over time in the light of financial innovation (e.g., Barber and Odean 2002; Choi, Laibson, and Metrick 2002; Choi et al. 2004; 2006; Thaler and Benartzi 2004; Benartzi and Thaler 2007; Beshears et al. 2009; Carroll et al. 2009; Choi, Laibson, and Madrian 2009a; b; D'Acunto, Prabhala, and Rossi 2019; Loos et al. 2020; Kalda et al. 2021; Beshears et al. 2023). To our knowledge, we are the first to study the account to which investment proceeds are paid as a central element of the choice architecture of brokerage accounts. Our results establish the importance of brokerage cash as a buffer that keeps investment proceeds from being spent and instead ready for reinvestment. Thereby, brokerage cash serves as a nudge towards higher long-term savings rates and increased stock market participation of retail investors. On the institutional side, Barth, Mitchell, and Sun (2023) highlight the value of brokerage cash as a mechanism that stabilizes the banking system when investors exit the market during downturns and their sales proceeds are parked in brokerage cash positions.

This study also adds to research on measurement error in imputed consumption (Eika, Mogstad, and Vestad 2020; Baker et al. 2022). When consumption is imputed as the difference between income and savings, we show that the disregard of brokerage cash positions (or other bank accounts to which investment proceeds are paid) can lead to a substantial overestimation of the consumption of investment proceeds. This overestimation may affect research on the relation between the stock market and consumption more generally, e.g., when investigating the consumption response to stock market downturns during which investors exit the market and park their sales proceeds in (potentially overlooked) brokerage cash positions.

Moreover, this study contributes to research on dividend clienteles (e.g., Baker and Wurgler 2004; Graham and Kumar 2006; Becker, Ivković, and Weisbenner 2011; Jiang and Sun 2020; Daniel, Garlappi, and Xiao 2021). In a subsample analysis, we investigate the uses of dividends by retirees who are argued to deliberately choose high-dividend

yield portfolios for consumption motives (e.g., Graham and Kumar 2006; Daniel, Garlappi, and Xiao 2021). Although we find that retirees do not adjust withdrawals (and thus consumption) to dividends, we find that retirees use dividend proceeds as substitutes for securities sales. These findings are consistent with retirees using dividends to save transaction costs as the retirees generate a constant (or at least dividend-invariant) income stream from their brokerage accounts.

Finally, our results have implications for studies that investigate the impact of dividend reinvestment on prices (Ogden 1994; Berkman and Koch 2017; Kvamvold and Lindset 2018; Hartzmark and Solomon 2023; Schmickler and Tremacoldi-Rossi 2023). Despite high average reinvestment rates in securities over the long run, our findings suggest that retail investors' reinvestment activity is not concentrated in terms of its target being the dividend-paying asset or in terms of its timing occurring shortly after payment. Therefore, retail investors' contribution to reinvestment-induced price pressure, both on the security and on the market level, is likely less pronounced than that of institutional investors.

The paper proceeds as follows. In Section 1, we analyze the CEX with respect to a time trend in dividend consumption. In Section 2, we explore our mechanism of payout modalities and bounded rationality. In Section 3, we study dividend uses in the German brokerage dataset. In Section 4, we present the results of our online survey. In Section 5, we reconcile our results with those of previous studies. Section 6 concludes. The Internet Appendix contains supplementary evidence and robustness checks.

1 Aggregate dividend consumption rates have decreased over time

To investigate how aggregate dividend consumption rates have developed over time, we analyze the Consumer Expenditure Survey (CEX), published by the US Bureau of Labor

Statistics. The CEX contains annual household-level data on expenditures, income (including dividends), and wealth of representative US households since the 1980s. Using CEX data from 1988 until 2001, Baker, Nagel, and Wurgler (2007) perform regressions of households' total expenditures in a given year on their dividend income in that year (as well as several controls). With this specification, the authors report a dividend consumption rate of 75%.[5]

We follow the data processing outlined by Baker, Nagel, and Wurgler (2007) and replicate their results for the 1988-2001 sample.[6] We then extend these results by adding CEX data from after 2001 and allowing for a time trend in dividend consumption. For the main specification, we add data until 2012 as this is the last year in which the CEX contains a variable for dividend income. Starting in 2013, dividend income is recorded together with interest income in one combined variable. We make use of this combined variable in an alternative specification in which we estimate the joint rate of consumption out of dividend and interest income using data until 2022. The results are reported in Table 1. In column one, we run the specification of Baker, Nagel, and Wurgler (2007) using data until 2001 and successfully replicate the dividend consumption rate of 75%. In column two, we use data until 2012 and add a linear time trend. For the start of the sample period in 1988, we estimate a dividend consumption rate of 86%. The estimate for the linear time trend indicates that this consumption rate decreases by 2.5 percentage points per year, on average. Over the whole sample period, this yields a strong decline in dividend consumption. Starting with 86% in 1988, a decrease of 2.5 percentage points per year over 24 years gives an estimated dividend consumption rate of only 26% in 2012. In column three, we estimate the time trend using an alternative specification,

[5] Baker, Nagel, and Wurgler (2007) also provide estimates based on other specifications, e.g., by running regressions in quarterly first differences (37% dividend consumption rate) or by using only non-durable expenditures as the independent variable (16% dividend consumption rate). Because all of these other specifications yield dividend consumption rates that are considerably lower than 75%, we focus on the level specification with total expenditures as the independent variable.

[6] Detailed results of this replication, including summary statistics and alternative regression specifications, can be found in Section A of the Internet Appendix.

i.e., by interacting dividends with a dummy that is zero in the replication period (from 1988 until 2001) and one in the extension period (from 2002 until 2012). Relative to the 75% rate in the replication period, we find a significantly lower consumption rate in the extension period of only 37% (75% - 38%). In column four, we use the full time series until 2022 and estimate a linear time trend in the joint consumption rate out of dividend and interest income.[7] For the start of the sample period in 1988, we estimate a consumption rate of 57%, close to the 58% in Baker, Nagel, and Wurgler (2007). Again, we obtain a strong negative time trend of -1.5 percentage points per year. Starting with 57% in 1988, a decrease of 1.5 percentage points per year over 34 years leads to an estimated consumption rate out of dividends and interest income of only 6% in 2022. Overall, our results provide evidence for a strong decline in dividend consumption rates over the past 30 years.

What has changed over the past 30 years? One aspect that has changed and that may have fundamentally contributed to the consumption of dividends is that dividends are, by and large, no longer paid out via checks, today. As we discuss in detail in Section 2, today's dividends are mostly directly deposited into brokerage accounts which makes their consumption harder and less enticing. If the decline in dividend consumption rates is rooted in the transition from checks to direct deposits, we would expect to see an earlier decline of the consumption rate among early adopters of direct deposits. Because we do not directly observe the way in which a household's dividends are paid out in the CEX, we resort to a proxy for the early adoption of innovations. We identify early adopters as households who own a personal computer in 1991 or earlier.[8] To put computer ownership rates at this time into perspective: Only 5% (17%) of households own a personal computer in 1988 (1991) in the CEX. By using this proxy, we assume

[7] In this specification, total returns are missing as a covariate because data on capital gains are only available until 2012. This likely only affects estimates to a small extent. The results of the regressions in which we include total returns (i.e., those that use data until 2012) only change minimally when we exclude total returns.

[8] Our results remain similar if we identify early adopters as households who own a personal computer in 1989 (1990, 1992, 1993) or earlier.

that households who own a computer are more likely to receive their dividends via direct deposits (as opposed to checks) than non-computer owning households in the late 1980s to early 1990s. A plausible channel could be online brokerage services which were a) more likely to be used by computer-owning households and b) more likely to pay out dividends via direct deposits. Regarding a), Bogan (2008) and Glaser and Klos (2013) provide evidence that households who owned computers in the early 1990s entered the stock market because they used online brokerage services. Regarding b), we analyze the 1995 Survey of Consumer Finances. We find that the rate of direct deposits of investment income is 22 percentage points higher among brokerage accounts with online services relative to those without them (32% vs. 10%; difference significant at the 1% level using Fisher's exact test).[9]

In column five, we include a dummy that is one for households that are early adopters (and zero otherwise) and interact this dummy with the household's dividend income. The results indicate that the dividend consumption rate of early adopters is 42 percentage points lower than that of other households at the same time. One might suspect that this difference can be explained by early adopters consuming less, on average. However, the results indicate that this is not the case. Average total expenditures of early adopters are USD 10,965 higher than those of comparable households at the same time. Another potential explanation could be that early adopters of computers are generally younger and therefore have a lower dividend consumption rate. In column six, we add an interaction of dividends with the age of the household head to control for age-related differences in dividend consumption rates. The results show that the lower dividend consumption rates of early adopters cannot be explained by age. The difference in dividend consumption rates between early adopters and other households increases to -70 percentage points

[9]We introduce the Survey of Consumer Finances more formally in Section 2, in which we use the survey for more analyses. The 1995 edition is the earliest edition that contains items on the direct deposits of investment income and the usage of online services. Technically, the question regarding online brokerage services was whether the household mainly uses a computer to do business with the institution that provides the household's brokerage account.

when controlling for the interaction of dividends and age. At the same time, the coefficient estimate for the interaction of dividends and age is close to zero and insignificant.

2 The mechanism: Payout modalities and bounded rationality

We argue that the transition from checks to direct deposits plays an important role for the decline in aggregate dividend consumption rates over time. Yet, given that dividends are directly deposited, the question follows: into which bank account? In this section, we pursue two goals: First, we track the change in dividend payment methods over time and document the landscape of brokerage account structures, today. To that end, we combine anecdotal evidence, information from the websites of brokers, and our analysis of the Survey of Consumer Finances. Second, we set up a framework of how boundedly rational investors may use their dividends differently depending on the payment method and the account structure they face. To that end, we employ the two aspects of bounded rationality that are most frequently used to explain investors' handling of dividends: mental accounting and default effects.

2.1 Dividend payment methods and brokerage account structures

There is ample anecdotal evidence that, in the past, investors received "a dividend check-in-the-mail" (Shefrin and Statman 1984, p. 275).[10] Today, dividend checks are rare and dividends are usually directly deposited into investors' accounts by their broker. Figure 1 presents screenshots of the websites of some of the largest brokers in the US. The quote from E*Trade, taken from the knowledge section of their website, summarizes the results well:

[10] Another example: "Why do firms pay and smooth dividends? Because my mom liked a steady check!" (Cochrane 2022, p. 8). Moreover, one of the authors can personally attest to cutting out dividend coupons for old ladies in the basement of a bank.

"If you buy and sell stock through a broker, dividend payments are almost always deposited directly into your brokerage account."

It seems that dividends were generally paid out via checks in the past and that they are generally paid out via direct deposits, today. The question that follows naturally is: When was the transition from checks to direct deposits? To answer this question, we study the Survey of Consumer Finances (SCF), published by the US Bureau of Labor Statistics. The SCF is a triennial survey in which US households provide detailed information on their assets, liabilities, and income. We filter the dataset by only keeping households that hold stocks or equity funds and that receive dividends. Furthermore, we drop observations where relevant survey items were imputed due to ambiguous or inconsistent answers. In the 1995-2022 editions, households were asked whether they have any investment income directly deposited into their accounts. Figure 2 plots the share of households with directly deposited investment income over time.[11] The results show a strong increase over time, with direct deposits almost quadrupling from 9% in 1995 to 34% in 2022. The largest increase takes place in the late 2000s which corresponds to the period in which we see a strong decrease in dividend consumption in the CEX.[12]

Given that dividends are directly deposited, another question follows naturally: into which bank account? To answer this question, it is useful to discuss "brokerage cash".[13] Brokerage cash positions are part of the brokerage account and serve as the link between an outside (reference) bank account and securities investments. If an investor transfers money to his brokerage account to buy securities, the money is added to the brokerage cash balance. In turn, if an investor sells securities or receives dividends, the proceeds are also added to the brokerage cash balance. Brokerage cash positions are generally not

[11] The SCF does not contain an item for investment income paid out via checks. Yet, given that the two options are mutually exclusive, the time trend for checks should mirror that for direct deposits.

[12] A valid concern regarding surveys in general is that they suffer from underreporting. Therefore, the true fractions of households with directly deposited investment income are likely higher. Nonetheless, we do not think that this would affect the time trend as that would require the underreporting to vary systematically over time (for which we see no reason).

[13] The term "brokerage cash" is, e.g., used by Robinhood. Other brokers may use different terms for equivalent cash positions. For examples of brokerage cash, see Section B of the Internet Appendix.

designed as bank accounts through which regular payment transactions are cleared (e.g., bills are paid). Table 2 gives an overview of brokerage cash at eleven large German and US brokers in 2023. The first column indicates whether brokerage cash is available at a broker. The results show that brokerage cash is available at all brokers but one. What is the alternative if a brokerage account does not have its own cash position? The first alternative, that some German banks offer, is that clients use their checking accounts for settling trades and receiving dividends. The second alternative, that some US brokers offer, is that the brokerage cash position can be repurposed by adding payment features such as debit cards or check writing. Effectively, these features transform the brokerage cash position into a checking account. The second column indicates whether it is possible to replace or repurpose the brokerage cash position at a broker. The results show that this is possible at most brokers with two exceptions from Germany and one from the US. Yet, the fact that it is possible to replace or repurpose the brokerage cash position does not mean that this always happens. The third column indicates what the default account structure is. The results show that accounts at most German brokers come with their own cash position per default (and are not directly linked to a checking account). For all brokers in the US that we investigate, payment features have to be actively enabled by the account holder. Therefore, the default is a cash position without payment features.

To quantify the frequency of different account structures among households, we again turn to the SCF. In the 1989-2022 SCF, households list the financial institutions that they do business with and list the types of accounts and payment cards that they have with each institution. Additionally, from 1995 until 2013, households list the ways in which they interact with each institution (e.g., by writing checks). As before, we limit the sample to households that hold stocks or equity funds and that receive dividends. Additionally, we limit the sample to institutions where the household has a brokerage

account.[14] Figure 3 plots developments of account structures and interactions over time. The plot on the left-hand side illustrates the share of brokerage accounts that are at institutions where the household has a checking account or a credit card (i.e., brokers with payment features). The results show that only 30% of brokerage accounts are at such institutions and that this rate has not changed much over time.[15] To see how account structures relate to behavior, we analyze how households interact with the institution where they have their brokerage account. The plot on the right-hand side illustrates the share of brokerage accounts that are at institutions where the household makes payments or withdrawals.[16] The plot shows the share among all brokerage accounts and the share among brokerage accounts at institutions where the household has (does not have) a checking account or credit card. As expected, the share of payments and withdrawals is much higher at brokers with payment features (72% vs. 31% in 2013). Yet, given the low prevalence of this account setting, the aggregate share of brokerage accounts that are at institutions where the household makes payments or withdrawals is low (43% in 2013). Note that if dividends are directly deposited into households' accounts, these 43% are also an upper bound for the rate of dividend consumption.[17] If a household does not make payments or withdrawals from the account into which its dividends are deposited, the household cannot spend the dividends.[18]

[14] In the 2022 SCF, 81% of stock market participants report to have a brokerage account. The remaining 19% could hold their securities in some other way (e.g., directly) or be the result of underreported brokerage accounts. Retirement accounts and securities held through retirement accounts are recorded separately in the SCF.

[15] In unreported analyses, we find that the rate varies substantially by institution type (e.g., 17% at brokerages vs. 55% at commercial banks in 2022).

[16] The responses that we classify as payments or withdrawals are: ATM, cash machine, debit card, check writing, credit card, automatic deposits or withdrawals, and other electronic transfers. Because the response items for transfers are not separated into deposits and withdrawals, this classification may overstate the share of withdrawals. Because some of the response items were not available in 1995 (such as credit cards), we exclude the 1995 SCF from this analysis.

[17] The upper bound does not hold if dividends are paid out by check as the household can spend the check without interacting with the check-writing institution. In light of the transition from checks to direct deposits in the 2000s, the share of payments and withdrawals may be suitable as an upper bound for dividend consumption only in later years (e.g., 43% in 2013).

[18] One might argue that households could still consume their dividends by using liquidity from another bank account. As we discuss below, we believe that such behavior would be inconsistent with the leading explanations why households would consume dividends in the first place (mental accounting and default effects).

2.2 Mental accounting and default effects

Next, we explore a mechanism that helps explain a) why dividends were mostly consumed in the past but are mostly reinvested today, b) why there is still heterogeneity in dividend consumption rates, today, and c) how dividend reinvestment comes about. The mechanism combines our findings on payment methods and account structures with the two leading explanations for investors' dividend reinvestment and consumption behavior: mental accounting (Thaler 1985; 1999) and default effects (Samuelson and Zeckhauser 1988).

According to mental accounting, investors consume dividends as a self-control mechanism (Shefrin and Statman 1984; Shefrin and Thaler 1988). To not consume all of their stockholdings, investors follow the simple rule to only consume their dividends. To that end, investors keep track of their dividends in a mental account that is separate from their mental account for stockholdings. If investors receive their dividends as a physical check in the mail, this can be done easily. Similar to the earmarking of money with the help of money jars, the physicality of the check makes it easy to maintain a separate mental account. By contrast, if dividends are directly deposited into a (virtual) bank account, the maintenance of a separate mental account would require cognitive effort (Heath and Soll 1996). Therefore, we argue that the absorption of dividends into a *physical* account also entails an absorption into the respective *mental* account. Mental accounts are composed based on the origin and intended use of funds (Zhang and Sussman 2018). The origin and intended use of brokerage cash are clearly related to investments as brokerage cash either comes from investment proceeds or from liquidity transferred to brokerage accounts with the purpose of being invested. Accordingly, we argue that investors assign brokerage cash to a mental account which they have a relatively high marginal propensity to *invest* from. By contrast, checking accounts are primarily used for spending and therefore likely

assigned to a mental account which investors have a relatively high marginal propensity to *consume* from.

Mental accounting also addresses the possibility that investors could consume dividends without making withdrawals from their brokerage account by using liquidity from their checking account. Such a strategy would require a mental *integration* of accounts which would be inconsistent with the mental *separation* of accounts that constitutes the reason why investors would consume dividends in the first place.

According to default effects, investors tend to follow the path of least resistance. We argue that the path of least resistance depends on the payout mode (check vs. direct deposit) and the type of account that dividends are deposited into (brokerage cash vs. checking account). The easiest way to handle a dividend check is to lump it together with other checks (e.g., pay checks) and deposit it into the checking account. The easiest way to handle a direct deposit is to let the money sit in the bank account. From there, the long-run path of least resistance depends on the account type. Brokerage cash positions (checking accounts) are used for trading (day-to-day spending), making reinvestment (consumption) the path of least resistance, e.g., by increasing purchases on the next rebalancing date (birthday of the wife).

Default effects also have implications for the way in which reinvestments come about. We argue that default effects favor reinvestments to occur implicitly rather than explicitly. By explicit reinvestment, we mean that the investor uses dividend proceeds to place a separate buy order, which he would not have placed without the receipt of the respective dividend. By implicit reinvestment, we mean that the investor either simply increases the size of a buy order, which he would have placed regardless of the dividend, or that the investor substitutes sales with dividend proceeds from the brokerage cash balance. In terms of default effects, the key difference between the two forms of reinvestment is that explicit reinvestment requires effort while implicit reinvestment does not. If an investor

substitutes sales with brokerage cash, the investor even saves effort as he makes fewer trades with than without the implicit dividend reinvestment. The question of explicit vs. implicit reinvestment has testable implications, e.g., in terms of timing, order numbers, and the reinvestment target, which we test in Section 3.

To sum it up, our mechanism helps explain...

a) why dividends were mostly consumed in the past but are mostly reinvested today. Brokers changed their default way to distribute dividends from checks (highly spendable) to direct deposits into brokerage cash positions (highly investable).

b) why there is still heterogeneity in dividend consumption rates, today. Some brokers pay out dividends via direct deposits into checking accounts (highly spendable).

c) how dividend reinvestment comes about. Dividends are often reinvested implicitly, e.g., after a few months, during rebalancing, by adjusting order sizes.

3 Dividend reinvestment: Evidence from a German brokerage

To study what investors do with their dividends if the dividends are directly deposited into brokerage cash positions, we study a German brokerage dataset in which we can observe brokerage cash positions. In the dataset, we track the flow of dividends into the different potential uses of dividends over time (i.e., cash increases, investments, and withdrawals from the brokerage account). We also test our mechanism with regard to the implicit reinvestment of dividends by analyzing the impact of dividends on securities purchases and sales, order numbers, and holdings of the dividend-paying asset. Finally, we study the dividend uses of two subsets of investors that may have particularly strong reasons for consuming dividends: retirees and investors who receive dividends on their checking accounts.

3.1 Data

The German brokerage dataset was first introduced by Dorn and Weber (2017). It contains monthly information on holdings and trades of 40,000 randomly sampled brokerage clients at one of the three largest online retail banks in Germany from January 2007 through October 2011. The variables include the values of brokerage cash, certificates of deposit (CDs), and securities held by an investor in a given month.[19] The brokerage records also contain the EUR sums of an investor's securities purchases and sales for each month. Additionally, we observe the annual interest payment that an investor earns on the brokerage cash balance. We match stock and fund holdings with dividend data from Datastream and CRSP.[20] The dataset includes information on funds for which the bank offers an automatic dividend reinvestment plan. Throughout our analyses, we separate dividends paid by such funds from other dividends. Thus, we can ensure that our results solely reflect self-directed investor behavior and not automatic reinvestments.

To investigate the flow of dividends, we formulate the following identity of sources and uses of funds:[21]

$$D_{i,t} + D_{AR,i,t} + I_{i,t} + R_{i,t} = Inv_{i,t} + CdInv_{i,t} + CshInc_{i,t} + AccWd_{i,t}. \tag{1}$$

$D_{i,t}$ and $D_{AR,i,t}$ denote the sums of non-automatically reinvested and automatically reinvested dividends paid to investor i in month t, respectively. $I_{i,t}$ denotes the amount of interest investor i receives on his brokerage cash balance in month t. $R_{i,t}$ denotes payments to investor i in month t that we do not observe explicitly due to data constraints, such as payments by bonds or structured securities. As securities other than stocks and

[19] We do not add CDs to the securities portfolio of an investor but account for them separately.

[20] In their raw form, these data represent pre-tax numbers. We incorporate tax considerations to estimate dividend payments actually received by investors as accurately as possible and describe these considerations in Section C of the Internet Appendix.

[21] For readability, we suppress the investor index i in our results tables.

funds make up less than 1% of our sample, we believe that $R_{i,t}$ is negligible.[22] $Inv_{i,t}$ denotes net investments in investor i's securities portfolio in month t. $CdInv_{i,t}$ denotes net investments in CDs by investor i in month t. $CshInc_{i,t}$ denotes the net increase in brokerage cash of investor i in month t. Finally, $AccWd_{i,t}$ denotes net brokerage account withdrawals by investor i in month t (i.e., net cash transfers from the brokerage account to the checking account). As we observe all other variables, neglecting $R_{i,t}$, explicitly in our dataset, $AccWd_{i,t}$ is the variable we infer as the residual in Equation (1).

The left-hand side of Equation (1) is entirely composed of non-negative payments to an investor that are not directly initiated by the investor himself. Variables here are purely sources of funds. The right-hand side of Equation (1) is composed of variables that can turn both positive and negative (i.e., they can become both sources and uses of funds). Yet, ceteris paribus, when a variable on the left-hand side is positive (i.e., when a dividend or interest payment is made), some variable on the right-hand side must turn positive and absorb the payment. Dividends and interest payments must either be reinvested, increase the cash balance, or be withdrawn from the brokerage account.

We follow the data processing from the US brokerage data analysis in Baker, Nagel, and Wurgler (2007). In particular, we scale all cash flow variables by $A_{i,t-1}$, the value of the securities portfolio of investor i at the end of the previous month $t-1$.[23] We exclude account openings and closings and investors whose portfolio value falls below EUR 10,000 (outside of closing months). We only include investor-months in which we can identify dividend data for at least 95% of assets and in which we have dividend data for each month t to $t-11$. We exclude investor-months in which any of the uses of funds (i.e., investments, cash increases, or withdrawals) exceeds 50% of portfolio value in absolute

[22] We repeat our main analyses excluding investor-months in which any assets but stocks or funds are held and find that the results do not significantly differ from our main results.

[23] For readability, the symbols defined above already include this scaling.

terms. After application of filters, we are left with 6,693 investors, providing 200,668 investor-month observations.

Table 3 presents summary statistics. The mean securities portfolio value is EUR 64,940 (median EUR 35,150). Stocks and funds make up 46% and 54% of the average portfolio, respectively. The average brokerage cash balance is EUR 26,460 (median EUR 9,860).[24] Mean net investments are positive at 0.41% per month. The average yield of non-automatically reinvested dividends is 0.13% per month (0.11% dividends paid by stocks plus 0.02% dividends paid by mutual funds). Among investors with non-zero dividend income, the median annual dividend income is EUR 647 (1.7% of portfolio value).[25] These numbers indicate that it may be insensible for many investors to deal with individual dividend payments one by one. Nonetheless, what investors do with their dividends, collectively and in the long run, has a great effect on investor wealth. For example, assuming an investment horizon of 30 years, annual total returns of 6%, consisting of 5% capital gains and 1% dividends, the gap in terminal wealth between an investor that fully reinvests dividends and an investor that immediately consumes dividends upon payment amounts to 33% ($1.06^{30}/1.05^{30} - 1$).

3.2 Delayed dividend reinvestment

To quantify what investors do with their dividends, we track the cumulative flows of dividends into the different potential uses over a one-year period. We run regressions of cash increases, investments, and account withdrawals on dividends paid to the investor in this month and the eleven preceding months.[26] Figure 4 plots the results which are based

[24] That cash balances are relatively high, on average, can be explained by the bank promoting brokerage cash as an interest-bearing savings account.

[25] For more detailed overviews of the dividend distribution, see Figure C1 and Figure C2 of the Internet Appendix.

[26] The regression design follows Baker, Nagel, and Wurgler (2007). We run the regressions in two different specifications for the eleven months of lagged dividends: with eleven separate dividend lags and with the eleven lags averaged into one variable. The two specifications are approximately equivalent (the sum of the coefficients for the individual lags is approximately equal to the coefficient for the average). The specification with the individual (averaged) lags is better suited for tracking the timing of flows (assessing the standard errors of the estimates of dividend uses over the whole year).

Control variables are cash flows from other investment income (automatically reinvested dividends and interest payments), capital gains over the preceding twelve months, beginning-of-month portfolio value, investor characteristics (age, sex,

on regression estimates from Table 4. The blue bars show how the share of dividend proceeds in investors' brokerage cash balances develops. The green, yellow, and purple lines show how the dividend proceeds are used for withdrawals from brokerage accounts, investments in CDs, and reinvestments in securities, respectively. Focusing on the short-term response first, we find that 88% of dividends remain as cash in brokerage accounts in the month of payment (blue bars). 15% of dividends are reinvested (purple line) and -3% are withdrawn from brokerage accounts (green line). This is evidence against the planned consumption of dividends being a widespread pattern. If investors planned to consume dividends, we would expect the investors to withdraw and spend the dividends shortly after payment (Bräuer, Hackethal, and Hanspal 2022). Moving to the long-run dividend uses, we find that dividends are gradually taken from the brokerage cash balance and reinvested in securities. After one year, 9% of dividends remain as brokerage cash (blue bars) and reinvestments in securities amount to 80% (purple line). Brokerage account withdrawals sum to only 12% (green line) and investments in CDs to only -1% (yellow line). Thus, our results suggest that dividends are rarely consumed and mostly reinvested in securities portfolios.[27]

To better understand the timing of delayed reinvestment, we investigate its relation to average trading activity. The lower panel of the figure plots average turnover in the one-year period after payment.[28] In conjunction with the upper panel, the figure shows a correlation between reinvestment activity and trading activity. In particular, delayed reinvestments peak (i.e., the incline of the purple line is steepest) three to six months

marriage status, profession, financial experience, account tenure, usage of automatic reinvestments, mean turnover, share of trading months, mean portfolio shares invested in funds, funds eligible for automatic reinvestment, and assets other than stocks and funds), and time fixed effects.

In Table C3 of the Internet Appendix, we run the same regressions with investor fixed effects and obtain similar results. To address the potential problem of scaling in fixed effects regressions, highlighted by Welch (2021), we follow Chaney, Sraer, and Thesmar (2020) and include the denominator (i.e., one over portfolio value), as an additional regressor in these fixed effects regressions.

[27] Because we study *net* brokerage account withdrawals, our results also account for the possibility that investors increase consumption by saving less (i.e., by reducing deposits into brokerage accounts).

[28] Average turnover x months after dividend payment is calculated as the weighted average turnover across investor-month observations with weights corresponding to the amount of dividends that have been paid to an investor x months ago. Turnover is calculated as the average of purchases and sales, scaled by beginning-of-month portfolio value.

after payment when trading activity is highest. Note that German companies usually pay dividends once a year, in May (see Figure C3 of the Internet Appendix). Therefore, variation in turnover across months after the average dividend payment mirrors seasonal variations in turnover. In line with the "gone fishin effect" (Hong and Yu 2009), trading and reinvestment activity is lower during summer (months one to three after payment if dividends are paid in May) and picks up towards fall (months four to six after payment).[29]

3.3 Implicit dividend reinvestment

The delay in reinvestments and their correlation with trading activity already indicate that most dividends may not be reinvested explicitly as explicit reinvestment would likely take place shortly after the dividend payment, independent of trading activity. In the following, we perform further analyses to see how reinvestments come about and test our mechanism with regard to implicit reinvestments. First, we separate net reinvestments into purchases and sales. The results in Table 4 show that 29% of dividends are used for additional purchases and 51% as substitutes for sales. How can dividends be used as substitutes for sales? This can best be illustrated with an example. Say an investor needs regular cash payments, for example USD 1,000 per month, to finance securities purchases, liquidity, or consumption. To satisfy this need, the investor usually sells assets worth USD 1,000 every month. But if this investor then receives dividends worth USD 300 in a given month, he only needs to sell assets worth USD 700 in that month. Economically, there is no difference between reinvestment via reduced sales and reinvestment via increased purchases. An investor could either substitute sales with dividends or keep sales unchanged and use dividends to repurchase the sold securities. In both cases, the investor's portfolio and consumption stream are exactly the same. Nonetheless, the

[29] Afterwards, reinvestment rates decay naturally as fewer and fewer dividends remain to be reinvested. The slight dip in months seven and eight after payment (December and January if dividends are paid in May), is likely driven by turn-of-the-year-specific trading patterns. For example, starting with the taxation of realized gains from 2009 onwards, the realization of losses for tax purposes as in Odean (1998) becomes relevant in our sample.

finding that a large share of dividend reinvestment is attributable to sales reductions is interesting as it supports the mechanism that dividends are often reinvested *implicitly* rather than *explicitly*.

Second, we analyze how reinvestments translate into order numbers. To do so, we study large payments from newly initiated dividends.[30] Such payments are a passive shock to investors' dividend income that serves as an optimal testing ground to a) reproduce our results using an alternative methodological approach that is robust to dynamic endogeneity concerns, b) check if our results hold up for large dividends, and c) analyze the impact of dividends on order numbers as a further test of implicit reinvestment. We classify a dividend as large and newly initiated if it is the first dividend paid by a security in at least two years and if the payment makes up at least 1% of an investor's beginning-of-month portfolio value.[31] To study the reinvestment of these dividends, we use a matched event study approach: For investor-months that receive large, newly initiated dividends (Treat == TRUE), we cumulate net investments, purchases, sales, as well as numbers of purchases and sales over the six-month period prior to the payment (Post == FALSE) and the six-month period following the payment (Post == TRUE).[32] This results in two observations (pre and post payment) for each payment of a large newly initiated dividend. Each pair of observations is matched with a pair of observations covering the same time period from a control group of investors that are not paid large newly initiated dividends (Treat == FALSE). The matching is based on the Mahalanobis (1936) distance in terms of dividends, net investments, purchases, sales, number of purchases, number of sales, and performance in the six-month pre-payment time frame.

[30] An alternative would be special dividends. Yet, there are very few large special dividends in our sample, which is why we focus on the more common dividend initiations.

[31] Technically, this includes dividends that are not strictly newly initiated. The important point for us is that an investor did not receive a dividend by the respective security in the recent past. To make sure the initiation is a passive shock, we exclude investors that only first bought the security during the half year prior to initiation.

[32] We scale these variables with the portfolio value at the beginning of the respective six-month window and exclude observations where any of the cumulated dividend uses, purchases, or sales exceeds 50% of this portfolio value. We choose a six-month time frame to reduce the influence of noise and as our previous results indicate that most reinvestment takes place during the first six months after payment.

On the one hand, we test if the increase in net investments from the pre-payment to the post-payment window is significantly larger in the treatment group than in the control group. This determines the estimate of dividend reinvestment. On the other hand, we test how this reinvestment comes about. To do so, we look at differences-in-differences with respect to purchases, sales, and the numbers of these. The results are illustrated in Figure 5 (and complemented by regression estimates in Table C4 of the Internet Appendix). The top left panel shows that the treatment and matching work. Recipients of newly initiated dividends receive dividends of similar magnitude as the control group in the pre-payment window but receive significantly larger payments in the post-payment window. The top right panel shows that net investments increase one-for-one with dividends. This finding supports that our results are robust to alternative methodological designs and confirms that also large dividends are reinvested. Next, we test how this reinvestment comes about. The middle left (right) panel shows a small post-payment increase in purchases (large post-payment decrease in sales) in the treatment group relative to the control group. This is in line with our previous results that dividends are often used as substitutes for sales. In the bottom panels, we test whether reinvestment is reflected in the *numbers* of purchases and sales. Both panels show little to no difference in order number changes between the treatment and the control group. Therefore, we conclude that reinvestment does mostly not stem from extra reinvestment-dedicated buy orders. Instead, reinvestment mostly occurs in the form of changed order sizes for trades that would have also occurred without the dividend payment.[33]

Third, we examine whether reinvestments in investors' portfolios are targeted at the divided-paying position. If reinvestments were targeted at the dividend-paying position, this would indicate that investors earmark the dividend proceeds as such and associate

[33] To check that our methodology would have been able to detect additional trades if there were any, we apply our empirical design to automatically reinvested dividends in Table C5 of the Internet Appendix. We find that the methodology is able to detect the extra trade initiated by the automatic reinvestment plan.

them with the paying position. If reinvestments were not targeted at the dividend-paying position, this would point to a mental disconnect between the dividend proceeds and the dividend-paying position. We follow Hartzmark and Solomon (2019) and analyze how the number of shares of a position changes over one year after the position pays a large dividend (i.e., a dividend that exceeds 1% of portfolio value). We compare this to the changes in the number of shares of the other positions that the investor holds, that do not pay a large dividend. If there was a lot of reinvestment targeted at the dividend-paying position, we should find that dividend-paying positions are increased more often, or decreased less often, than non-paying positions. Figure 6 plots the results. For 80% (82%) of positions with (without) large dividend payments, there is no change in the number of shares held, for 8% (5%), there is an increase, and for 12% (13%) there is a decrease. These numbers are evidence against reinvestments being targeted at the dividend-payer as the fractions of unchanged, increased, and decreased positions are almost the same between dividend-payers and non-payers, consistent with Kaustia and Rantapuska (2012) and Hartzmark and Solomon (2019).[34]

3.4 Dividend reinvestment by retirees and investors with directly linked checking accounts

Next, we focus on two subsets of investors with potentially strong reasons for dividend consumption: retirees and investors with directly linked checking accounts. We re-run the regressions of the different dividend uses on dividends and include interactions of dividends with dummies for the two investor groups. Table 5 reports the results. First, as argued by Miller and Modigliani (1961) and supported empirically by Graham and Kumar (2006) and Daniel, Garlappi, and Xiao (2021), retirees may have a preference

[34] Although the 3 percentage point difference in the fraction of increases is significant, statistically (with standard errors clustered by investor, month, and ISIN), it is hardly significant, economically. Moreover, unreported analyses show that the higher fraction of share increases among dividend payers is mostly driven by those positions' larger average sizes. Once a position's size is controlled for, the dividend-payer status is only associated with a 0.5 percentage point difference in the fraction of increased positions.

for dividend-paying assets as a means of creating a continuous consumption stream. However, the results indicate that the dividend uses of retirees do not differ significantly from other investors and that retirees largely reinvest their dividends. Brokerage account withdrawals by retirees are only 1% (-6% + 7%) in the month of payment and -42% (27% - 69%) in the eleven months following payment. Reinvestments by retirees are estimated to be 20% (14% + 6%) in the month of payment and 84% (62% + 22%) in the eleven months following payment. In comparison with other investors, even more reinvestments are made via substituted sales (38 percentage point difference). An option that could therefore still be reconciled with our results is that retirees regularly sell parts of their holdings to generate a constant consumption stream and use dividends as substitutes for sales. While such investors would consume dividends *mechanically*, they would not consume dividends *economically* as their consumption streams remain unaffected by dividend payments.

Second, we analyze a small subsample of investors whose dividends are directly paid out to their checking accounts, a setting for which our mechanism predicts more consumption and less reinvestment. While almost all investors in our sample have a brokerage cash position, 25 investors do not have a brokerage cash position and instead use their checking accounts to settle investment-related transactions. Per default, every account at the bank comes with a brokerage cash position. But if a brokerage client also has a checking account at the bank, the client can replace the brokerage cash position with his checking account.[35] Turning to the dividend uses of investors with directly linked checking accounts, estimates are naturally quite noisy, given the small number of observations. Still, the direction of the estimates is generally in line with the prediction of our mechanism: more consumption and less reinvestment. We find that having dividends

[35] One might wonder why only so few investors do so. The reason is not that only so few brokerage clients have a checking account at the bank. In fact, most brokerage clients also have a checking account at the bank. We believe that two main reasons are that the brokerage cash position is a) the default and b) attractive as the position paid more interest than the checking account (a fact that was strongly promoted by the bank).

paid out to a checking account increases brokerage account withdrawals by 55 percentage points (1.12 - 0.57). Conversely, net reinvestments into securities are reduced by 54 percentage points (-0.25 - 0.29). A natural concern regarding the causal interpretation of these results is that investors who have a preference for consuming dividends might choose an account structure that makes the consumption of dividends easier. To address this concern, we analyze the usage of automatic dividend reinvestment plans among investors with directly linked checking accounts. If investors chose their account structure because of a preference for consuming dividends, we would also expect these investors to disable automatic dividend reinvestment plans. Out of the 25 investors with directly linked checking accounts, 4 investors receive dividends that are eligible for the automatic reinvestment plan and all 4 use the plan. To support this result with additional observations, we check the plan usage in the dataset before the application of filters. In the pre-filter sample, 20 investors with directly linked checking accounts receive dividends that are eligible for the automatic reinvestment plan and 18 of them use the plan. The resulting plan usage rate of 90% is statistically and economically not different from the 92% rate among investors with brokerage cash (using Fisher's exact test). The fact that most investors with directly linked checking accounts use automatic dividend reinvestment plans is evidence against the concern that the choice of account structure might be based on a preference for consuming dividends.[36]

4 Additional evidence from an online survey

To provide further support for the external validity of our results and gain additional, independent data on dividend uses, we perform an online survey with retail investors. In 2022, we recruit 300 participants (150 from Germany and 150 from the US) via Prolific.

[36] A detailed comparison of summary statistics in Table C2 of the Internet Appendix does also not reveal any other significant differences between investors with and without brokerage cash.

We require stock market investment experience and restrict our sample to investors with a brokerage account. After application of these filters as well as an attention check, 293 respondents remain.[37] First, we want to find out how common brokerage cash is. We find that 71% of respondents have a brokerage account that comes with its own cash balance; 29% have investment-related transactions settled via their checking account (or another bank account). These numbers are similar among German and US respondents (68% vs. 75% and 32% vs. 25%; differences statistically insignificant using Fisher's exact test). This is further evidence that, today, dividends are mostly directly deposited into brokerage cash positions.[38] It is important that the survey participants have the same understanding of brokerage cash as we do. To check this, we ask participants about the steps that they would need to take to pay for a TV using dividend proceeds. Of those respondents with brokerage cash, 97% would first transfer the dividend to another bank account before buying the TV. By contrast, of those respondents with directly linked checking accounts, only 45% would first transfer the dividend to another bank account before buying the TV (difference statistically significant at the 1% level using Fisher's exact test). The remainder would directly purchase the TV from the account that the dividend was paid out to. This means we can be confident that respondents who state that their accounts have brokerage cash indeed have brokerage cash as we understand it. Additionally, this finding underlines that brokerage cash positions increase the amount of effort that is necessary to consume investment proceeds.[39]

[37] Detailed survey questions and results are in Section D of the Internet Appendix.

[38] In line with our online research, the results from the SCF, and our German brokerage dataset, the factor that enables respondents to not have a brokerage cash balance seems to be having checking and brokerage accounts with the same bank. In the survey, 80% of respondents who have their main bank account and their main brokerage account at different banks have a brokerage cash balance. By contrast, only 45% of respondents who have their accounts at the same bank report to have a brokerage cash balance (difference statistically significant at the 1% level using Fisher's exact test).

[39] The SCF also contains an item which (we believe) is supposed to ask about brokerage cash: "Not including any accounts you've told me about, do you have a cash or call money account at a stock brokerage?" Only about one quarter of households with brokerage accounts answer with "yes". We believe that the low rate of confirmatory responses is due to the ambiguous phrasing of the question: Brokerage cash positions are part of the brokerage account. As respondents were already asked about their brokerage account in a previous question, the prompt to "not includ[e] any accounts you've told me about" might therefore be interpreted as a prompt to only consider bank accounts outside of the brokerage account (which would exclude brokerage cash). In light of the results of our online survey and our online research on account structures at different brokers, we believe that brokerage cash is underreported in the SCF due to the ambiguous phrasing of the question.

Second, we want to know what survey respondents mainly did with the dividend payments they received in the past. We separate the question into two parts and ask participants what they mainly did with dividends in the short run (i.e., in the first week after payment) and what they mainly did with dividends in the long run (i.e., until today). In the first week after payment, 56% of respondents (who received dividends in the past) reinvested dividends, 40% did nothing and let dividends sit in the bank, and 3% spent them. Over the long run, the corresponding proportions are 76% for reinvestment, 13% for doing nothing, and 11% for spending. The long-run proportions are very similar to our brokerage data estimates: Dividends are largely reinvested and rarely consumed. Yet, the proportions for the first week after payment are quite different from our brokerage data estimates. A lot fewer survey respondents report they have done nothing and a lot more respondents report they have quickly reinvested their dividends. A potential explanation might be selective memory as it is hard, if not impossible, to remember doing nothing. Therefore, it is plausible that respondents overreport active behavior and underreport passive behavior. What escapes this concern is that only few respondents report to have spent dividends, especially shortly after payment. If investors consciously consumed dividends, as mental accounting-based explanations generally postulate, investors would remember this. Therefore, the survey results provide further evidence against widespread conscious consumption out of dividends.

Third, we investigate whether there are differences in dividend uses between survey respondents with and without brokerage cash. The results are depicted in Figure 7. On the one hand, reinvestment rates are higher among respondents with brokerage cash than respondents without it (61% vs. 44% in the week following payment, difference statistically significant at the 5% level, and 79% vs. 67% over the long run, difference statistically significant at the 10% level using Fisher's exact test). On the other hand, consumption rates are lower among respondents with than without brokerage cash (2%

vs. 8% in the week following payment, difference statistically significant at the 5% level, and 9% vs. 15% over the long run, difference statistically insignificant using Fisher's exact test). These results are in line with our proposed mechanism and the results from our brokerage data analysis.

5 Reconciliation with previous studies

In this section, we perform additional analyses that help explain differences between our results and those of previous studies. First, we revisit the US brokerage data analysis by Baker, Nagel, and Wurgler (2007) and investigate how the results may be impacted by unobserved brokerage cash positions and a regression design which does not control for cross-sectional differences between investors. Second, we carefully calibrate a simulation to estimate the extent to which the dividend consumption rates in Di Maggio, Kermani, and Majlesi (2020) may be overestimated by a bias in imputed consumption that is (also) caused by unobserved bank accounts.

5.1 Baker, Nagel, and Wurgler (2007)

Besides their analysis of the CEX, Baker, Nagel, and Wurgler (2007) study the US brokerage dataset introduced by Barber and Odean (2000) from 1991 until 1996. As in our German dataset, brokerage accounts in the US dataset have cash positions to which investment proceeds are paid. To the extent that dividends are directly deposited into these cash positions, our mechanism would predict the same pattern as in the German dataset:[40] Dividends are initially parked as brokerage cash and then reinvested with a delay. Why do Baker, Nagel, and Wurgler (2007) not observe this pattern in the US brokerage dataset? To answer this, we first need to understand how Baker, Nagel, and

[40] We have no direct knowledge of whether the US broker paid out dividends via check or direct deposit at that time. Yet, the latter seems likely given that the broker already offered online trading at that time (Barber and Odean 2002). We thank Terry Odean for corresponding with us about this matter.

Wurgler (2007) analyze dividend uses. The authors introduce net portfolio withdrawals, $PfWd_{i,t}$, as their main variable of interest:[41]

$$PfWd_{i,t} = A_{i,t-1} + G_{i,t} + D_{i,t} + D_{AR,i,t} - A_{i,t}. \tag{2}$$

$G_{i,t}$ denotes the capital gains of the securities portfolio of investor i in month t. For easier interpretation, the terms describing the change in portfolio value can be collapsed into net investments, $Inv_{i,t} = A_{i,t} - (A_{i,t-1} + G_{i,t})$, and net portfolio withdrawals can be expressed as:

$$PfWd_{i,t} = D_{i,t} + D_{AR,i,t} - Inv_{i,t}. \tag{3}$$

Equation (3) shows that net portfolio withdrawals are contemporaneous dividends minus net investments. In regressions of net portfolio withdrawals on contemporaneous (lagged) dividends, full reinvestment gives a coefficient of zero (minus one), and no reinvestment gives a coefficient of one (zero). In the US brokerage dataset, Baker, Nagel, and Wurgler (2007) obtain contemporaneous coefficients near one and lagged coefficients near zero, indicating an absence of both immediate and delayed reinvestments. But does that mean that dividends are consumed?

Inserting Equation (3), into our identity of sources and uses of funds, Equation (1), gives:

$$PfWd_{i,t} = CshInc_{i,t} + CdInv_{i,t} + AccWd_{i,t} - I_{i,t} - R_{i,t}. \tag{4}$$

Equation (4) highlights the fact that portfolio withdrawals, $PfWd_{i,t}$, do not automatically translate into brokerage account withdrawals, $AccWd_{i,t}$. Yet, only the latter provide the liquidity for the consumption of dividend proceeds. Instead, large $PfWd_{i,t}$ could

[41] While Baker, Nagel, and Wurgler (2007) reference portfolio withdrawals as $C_{i,t}$, we use the symbol $PfWd_{i,t}$. To keep the naming of the withdrawal variables $PfWd_{i,t}$ and $AccWd_{i,t}$ separate, we refer to the former as portfolio withdrawals and to the latter as brokerage account withdrawals. To stay consistent with our notation, we include two separate dividend variables, separating payments depending on their eligibility for automatic reinvestment.

mask the fact that uninvested dividend proceeds simply raise the brokerage cash balance by means of large brokerage cash increases, $CshInc_{i,t}$.

To demonstrate this, we replicate and expand Figure 2 from Baker, Nagel, and Wurgler (2007) in our German brokerage dataset in which brokerage cash positions are observable (in contrast to the US dataset, in which cash positions are not observable). We sort investor-months with positive dividend payments into deciles based on the amount of dividends received. In Figure 8, we plot median and mean net portfolio withdrawals, investments, brokerage account withdrawals, and brokerage cash increases against median and mean dividends within each decile. In the first row, we relate portfolio withdrawals with dividends. As in Baker, Nagel, and Wurgler (2007), portfolio withdrawals increase one by one with dividends in the month of payment, both in terms of median and mean values. As can be seen from the flat relation between investments and dividends in the second row, this finding reflects the general absence of immediate reinvestment. Yet, the panels in row three illustrate that also withdrawals from brokerage accounts are essentially unrelated to dividends in the month of payment. Instead, the panels in the last row show that brokerage cash balances increase one by one with dividends, just as portfolio withdrawals do. The key takeaway is consequently that portfolio withdrawals, introduced as a "precursor to expenditure" (Baker, Nagel, and Wurgler 2007, p. 232), do not easily translate into expenditure as dividends are not even withdrawn from brokerage accounts. Instead, large initial portfolio withdrawals mostly mask initial investor inertia (i.e., that dividends accumulate as cash).[42]

Nonetheless, this does not explain why Baker, Nagel, and Wurgler (2007) do not find any *delayed* reinvestment. A potential reason could lie in the regression design. The authors regress portfolio withdrawals (i.e., dividends minus net investments) on

[42] In Table C6 of the Internet Appendix, we run regressions of net portfolio withdrawals on dividends. Due to the relation between net portfolio withdrawals and net investments from Equation (4), estimates for net portfolio withdrawals in the month of payment (in the months following payment) are equal to one (zero) minus the estimate for net investments.

dividends and returns without controlling for any investor characteristics. Not controlling for investor characteristics could lead to biased estimates if investors' dividend yield was correlated with their investment activity. An indication for such a correlation is provided by Graham and Kumar (2006) who study the same US brokerage dataset and report a significant negative correlation between dividend yield and turnover. Therefore, we revisit the US brokerage dataset.[43] To test for a negative correlation between dividends and net investments, we separate investors into six groups based on their average ordinary dividend yield (five quintiles plus one group for investors with zero dividends). For each group, we calculate average dividends and net investments. The results are plotted in Figure 9. The figure reveals a strong negative correlation between dividends and net investments. Especially those investors who are in the top quintile of dividend yields have significantly lower average net investments. Compared with investors in the bottom quintile, they invest 0.5 percentage points less per month. The economic significance of this difference is underlined by the fact that it even exceeds the 0.3 percentage point difference in average *dividends* between the top and bottom quintile (which are formed on the basis of *dividends*).

Based on this finding, we re-run the regressions of Baker, Nagel, and Wurgler (2007) with modifications that try to account for the lower average net investments of high-dividend yield investors. The results are reported in Table 6. The first column shows estimates without controls which are similar to those reported by Baker, Nagel, and Wurgler (2007). 91% of ordinary dividends are withdrawn from portfolios in the month of payment (i.e., only 9% are reinvested). The coefficient estimate for lagged ordinary dividends (20%) is positive and insignificant, not indicating any delayed reinvestment. For special dividends, the estimates of portfolio withdrawals are 106% in the month of

[43] We prepare the data according to the steps outlined by Baker, Nagel, and Wurgler (2007) and replicate their first figure and summary statistics in Section E of the Internet Appendix. We focus on the analyses in which dividends are separated based on their type (ordinary, special, and fund) because the authors argue that estimates for fund dividends (and thus also total dividends) are affected by automatic reinvestment plans.

payment and -36% in the following eleven months, indicating no contemporaneous but some delayed reinvestment. For fund dividends, portfolio withdrawals are only 18% in the month of payment, meaning that fund dividends are almost entirely reinvested shortly after payment, likely by automatic reinvestment plans. In the second column, we add a dummy that is one for investors in the top quintile of ordinary dividend yields (among those investors with a non-zero yield) and interact this dummy with ordinary dividends. Thereby, the coefficient of the dummy absorbs cross-sectional differences in average net investments (and thus, average portfolio withdrawals) between the group of high-dividend yield investors and the group of all remaining investors. In turn, dividend withdrawals are estimated based on variation within each of these two groups but not based on variation between them. With this modification, net portfolio withdrawals of ordinary dividends in the month of payment are estimated at 86% (78% for high-dividend yield investors), similar to the estimates without controls. Yet, in the months following payment, the results now indicate significant delayed reinvestments of 107% (81% for high-dividend yield investors). In the third column, we follow our analyses of the German data and also add portfolio characteristics (average trading activity, asset allocation, and portfolio size) and time fixed effects as controls. The estimates of delayed reinvestment increase further to 121% for ordinary dividends (80% for high-dividend yield investors) and 54% for special dividends. Thus, by controlling for investor heterogeneity, we can replicate the high rates of delayed reinvestment that we find in the German brokerage data also in the US brokerage data.

5.2 Di Maggio, Kermani, and Majlesi (2020)

Di Maggio, Kermani, and Majlesi (2020) estimate dividend consumption rates of up to 60% using an administrative dataset of Swedish households. The dataset includes information on households' asset holdings and income, which the authors use to impute

consumption ($Consumption = Dividends + OtherIncome - Savings$). Yet, the authors note that not all asset holdings are covered in the dataset as not all bank accounts had to be reported to Swedish authorities. Until 2005, only bank accounts with annual interest income above SEK 100 had to be reported. Starting in 2006, only bank accounts with balances above SEK 10,000 had to be reported. This leads to considerable underreporting of bank accounts. E.g., in 2002, 2 Mio. out of 4.8 Mio. Swedish households are represented with a bank account balance of zero in the dataset (Calvet, Campbell, and Sodini 2007), although 99% of adult Swedes have a bank account (Di Maggio, Kermani, and Majlesi 2020). Such an underreporting of bank accounts may cause an upward bias in the estimation of dividend consumption rates. If investors leave dividends parked in bank accounts that are not observable, savings are underestimated and consumption is overestimated. To estimate the extent to which the results in Di Maggio, Kermani, and Majlesi (2020) may be affected by this bias, we calibrate a simulation.

Di Maggio, Kermani, and Majlesi (2020) estimate dividend consumption rates separately for five different wealth groups of Swedish households (percentiles 5-50, 50-70, 70-90, 90-95, and 95-100). For each of these wealth groups, the authors report summary statistics for wealth and income, which we use to calibrate our simulated data. In any of the wealth groups, we assume that 30% of households consume their dividends. The other 70% reinvest their dividends, half in the same year, half in the next year. Until the dividends are reinvested, they remain in the brokerage cash balance (or any other type of bank account which dividends are paid out to). To calibrate the starting cash balances, we use our German brokerage dataset. In the German brokerage dataset, we group investors into five wealth groups (percentiles 5-50, 50-70, 70-90, 90-95, and 95-100) and estimate the distribution of the ratio of cash to cash plus stock wealth for each wealth group.[44] We then combine these distributions with the stock wealth data, that we sim-

[44] For this, we use observations from our German brokerage dataset before the portfolio-value based filter is applied.

ulated on the basis of the Swedish summary statistics, to generate the starting balances of brokerage cash.[45] To estimate the interest earned on brokerage cash, we use historical interest rates for brokerage cash at Nordea, one of Sweden's four largest retail banks. The rates range from 0% in 2004 to 2.6% in 2007 (see Figure F1 of the Internet Appendix for sources). We then make brokerage cash positions unobservable if their interest/balance is below the reporting thresholds described above.[46] Following Calvet, Campbell, and Sodini (2007) and Di Maggio, Kermani, and Majlesi (2020), we impute balances of unobserved cash positions based on observed cash positions.[47] Finally, we calculate imputed consumption as the difference between income and savings (where savings are based on imputed cash balances if the brokerage cash position is unobservable).

Using the simulated data, we run the regressions described in Di Maggio, Kermani, and Majlesi (2020). First differences in households' consumption are regressed on first differences in households' dividends with the latter being instrumented by passive first differences in dividends (i.e., the change in dividends that would have occured with unchanged holdings). Table 7 presents the results. As a benchmark, Panel A reports estimates when consumption is imputed using actual savings (i.e., without limitations in observability of brokerage cash balances). For all wealth groups, the regression estimates of dividend consumption rates are virtually identical with the actual rate of 30%. In Panel B, consumption is imputed under the restriction of limitedly observable brokerage cash. The results show dividend consumption rate estimates of 72%, 56%, 46%, 38%, and 35%

[45] As the summary statistics in Table F1 of the Internet Appendix show, the resulting brokerage cash balances are quite high relative to other wealth positions (e.g., on average, around one half of stock wealth). This makes our simulation conservative as the share of unobserved cash positions decreases, the higher their balances are.

[46] We do not make all brokerage cash positions unobservable that are below the reporting thresholds because Calvet, Campbell, and Sodini (2007) document that 250,000 bank accounts are reported despite their interest being below the reporting threshold. Given that at least 4 Mio. bank accounts are not reported (2 Mio. households times 2 bank accounts per household), we assume that 6% (0.25/4.25) of brokerage cash positions are observed regardless of their interest/balance. This is a conservative assumption as it ignores the possibility that individuals have multiple unreported accounts. For an overview of the thresholds and the resulting observability limitations, see Table F2 of the Internet Appendix.

[47] More precisely, we perform the imputation via regressions of cash balances on total income and financial wealth other than cash. Importantly, as in Calvet, Campbell, and Sodini (2007) and Di Maggio, Kermani, and Majlesi (2020), dividends only enter the regression as a part of total income but not as a separate regressor. As in the aforementioned studies, the regressions only use observations for those cash positions that are observed despite the interest/balance being below the reporting threshold (see the previous footnote).

for wealth groups one through five. Relative to the actual rate of 30%, consumption is overestimated in each wealth group (by 42pp., 26pp., 16pp., 8pp., and 5pp., respectively). In Panels C through E, we perform sensitivity analyses from Di Maggio, Kermani, and Majlesi (2020) and confirm that the overestimation persists through various specifications. The overestimation is strongest for the lowest wealth groups. This is unsurprising as the reason for the overestimation are cash positions that are not observed because of their small balances. In the bottom row, we show that the shares of unobserved cash positions are 72%, 36%, 32%, 24%, and 22% for wealth groups one through five.

Di Maggio, Kermani, and Majlesi (2020) estimate dividend consumption rates of 56%, 60%, 51%, 59%, and 39% using the baseline specification in the Swedish dataset. Subtracting the parts that were due to overestimation in our simulation (42pp., 26pp., 16pp., 8pp., and 5pp.), these estimates would also be consistent with actual dividend consumption rates of 14%, 34%, 35%, 51%, and 34% in the Swedish dataset. Further analyses from Di Maggio, Kermani, and Majlesi (2020) support that their results may be significantly affected by overestimation. On the one hand, the authors re-run their main regressions in a sample that is restricted to households for which imputed bank accounts make up less than 10% of total bank accounts. This means that all households in the restricted sample have at least one bank account that is observed. Importantly, this does not necessarily mean that the account to which dividends are paid out is observed. Nonetheless, the restriction likely reduces the degree of overestimation as it is reasonable to assume that the share of unobserved bank accounts to which dividends are paid out is lower in the restricted sample. In line with a reduction in overestimation, Di Maggio, Kermani, and Majlesi (2020) report lower consumption rates in the restricted sample (59%, 46%, 44%, 39% and 25%).

On the other hand, the authors also run regressions of savings in bank accounts on dividends. The authors estimate that only very few dividends remain in bank accounts

(14%, 6%, 4%, 3%, and 6%). It is questionable whether these estimates are plausible given that the results by Di Maggio, Kermani, and Majlesi (2020) are based on December-to-December differences in bank account balances. For example, the results would leave little room for dividends paid in December to remain in bank accounts until January.[48] The more plausible explanation could be that the bank accounts, in which the dividends remain, are not observed.

6 Conclusion

It is a long-standing fact that retail investors mostly consume dividends and rarely reinvest them. Using a broad range of datasets (consisting of two household surveys, two brokerage datasets, an online survey, and a simulated dataset), we show that this fact is no longer true, today. We provide evidence that changed payment methods play an important role in the transition from consumption to reinvestment of dividends.

Today, dividends are usually directly deposited into brokerage cash positions. We find that these positions nudge investors towards reinvesting investment proceeds instead of spending them. Although intuitive, the structure of brokerage accounts has been overlooked as an important determinant of investor behavior, so far. Our analysis of the role of brokerage cash positions provides an important insight to retail investors, financial institutions, and policymakers. At first glance, it might seem convenient for investors to fully integrate all of their bank accounts. Yet, our results show that it could actually be helpful for investors to keep their accounts separate in order to achieve a higher long-term savings rate and a higher stock market participation.

[48] Note that this is different from our regressions with monthly lags in the German brokerage dataset. When we estimate the share of dividends that is is in cash balances after a year, this means twelve months after the dividend payment.

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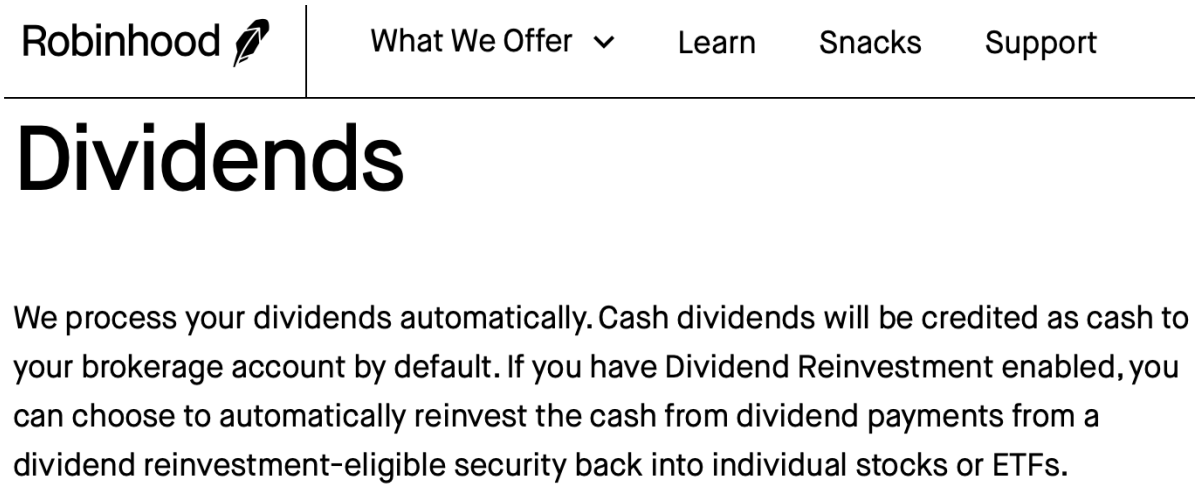
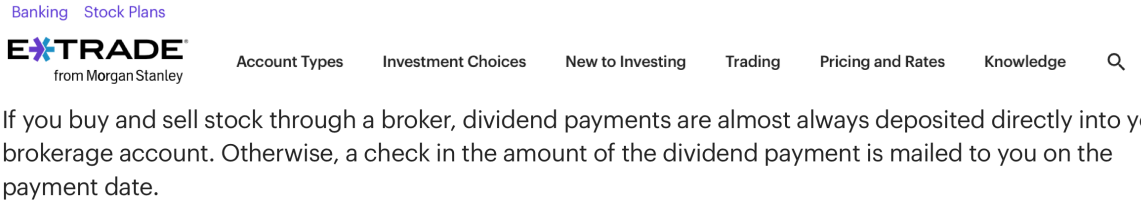
Figure 1: Examples of dividend payment methods at large US brokers

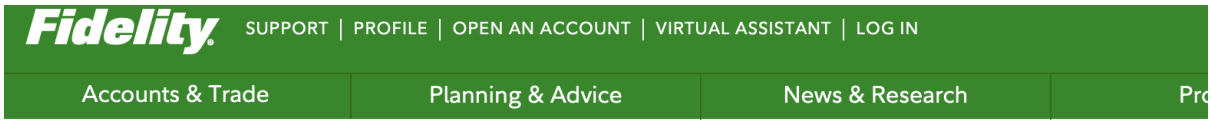
Panel A: Robinhood



Panel B: E*Trade

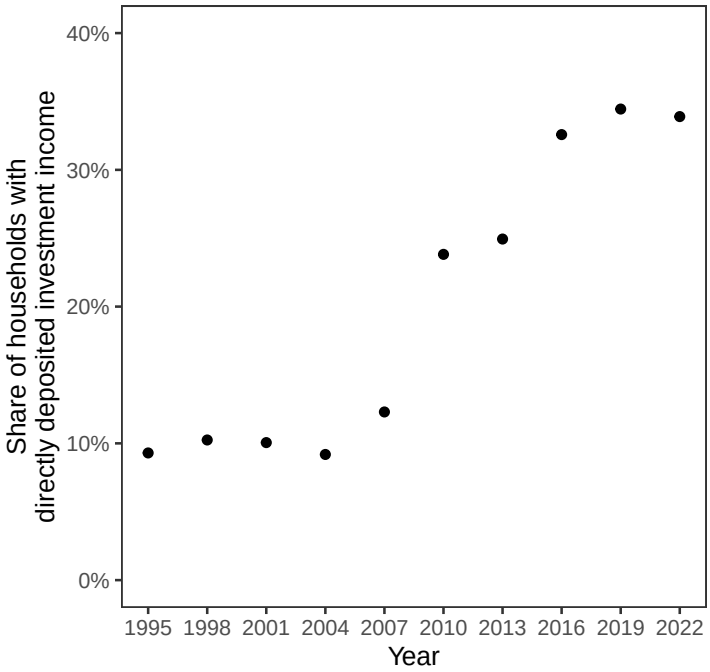


Panel C: Fidelity



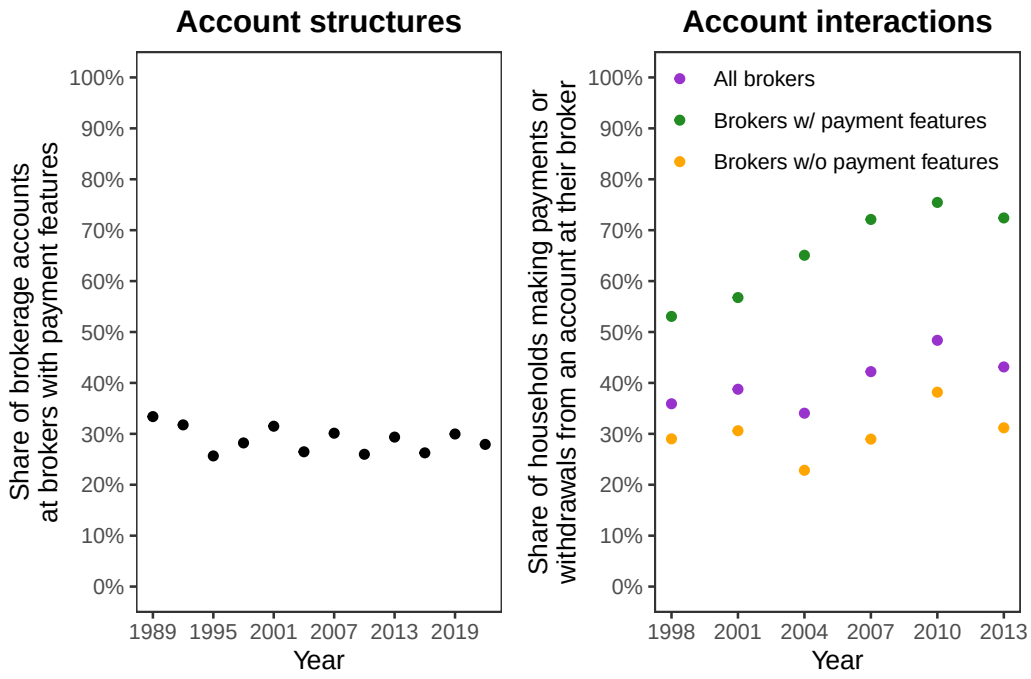
Note: This figure shows screenshots of dividend payment methods at three large US brokers. The screenshots capture content of the following websites (as of September 26, 2023): https://robinhood.com/us/en/support/articles/dividends/, https://us.etrade.com/knowledge/library/getting-started/what-is-a-dividend, https://www.fidelity.com/customer-service/how-to-dividend-and-cap-gains-distributions.

Figure 2: Survey of Consumer Finances: Direct deposits of investment income



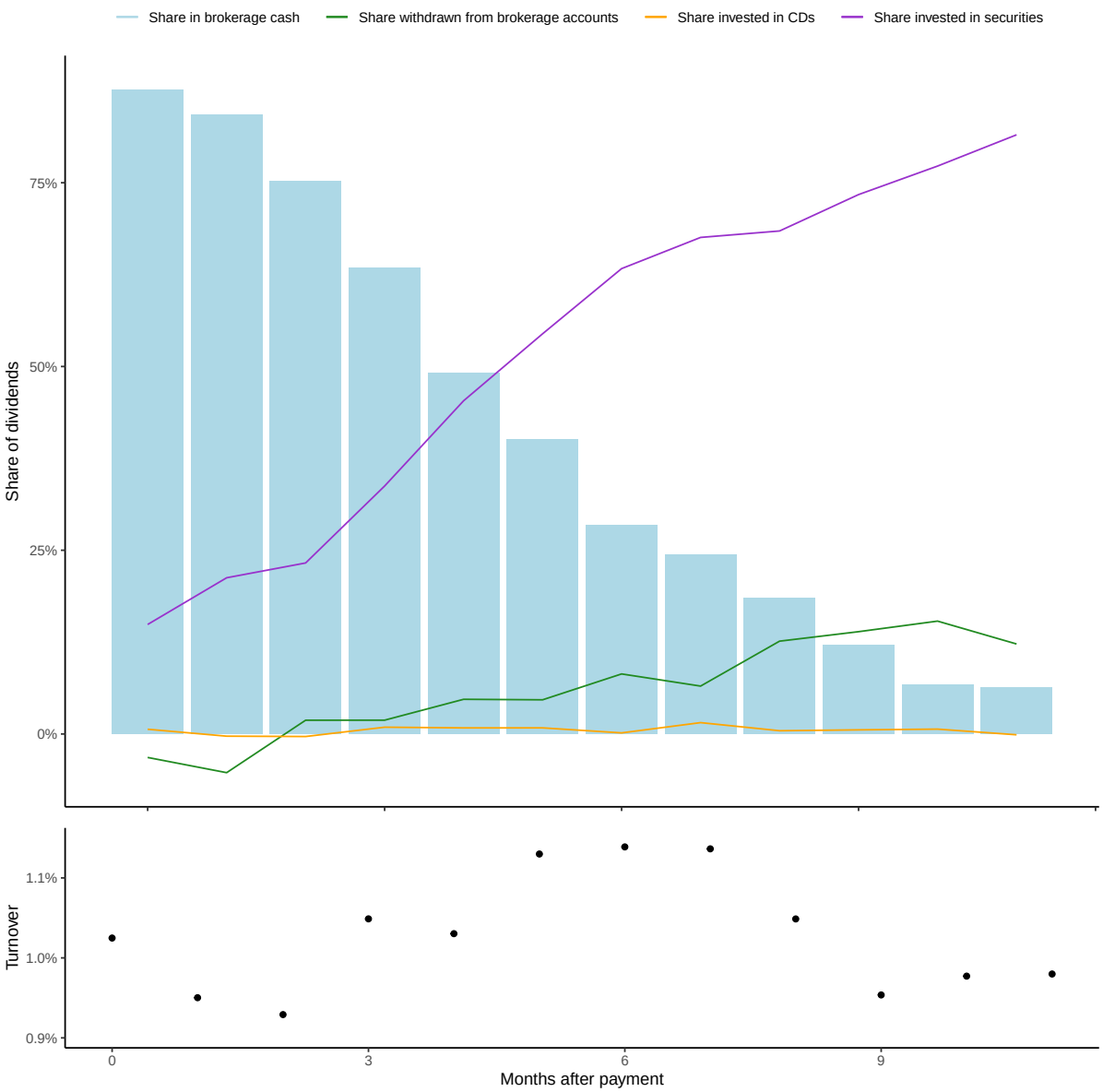
Note: This figure shows the share of households with direct deposits of investment income in the 1995-2022 SCF. Only households that participate in the stock market and receive dividends are included. N = 10,135.

Figure 3: Survey of Consumer Finances: Account structures and interactions



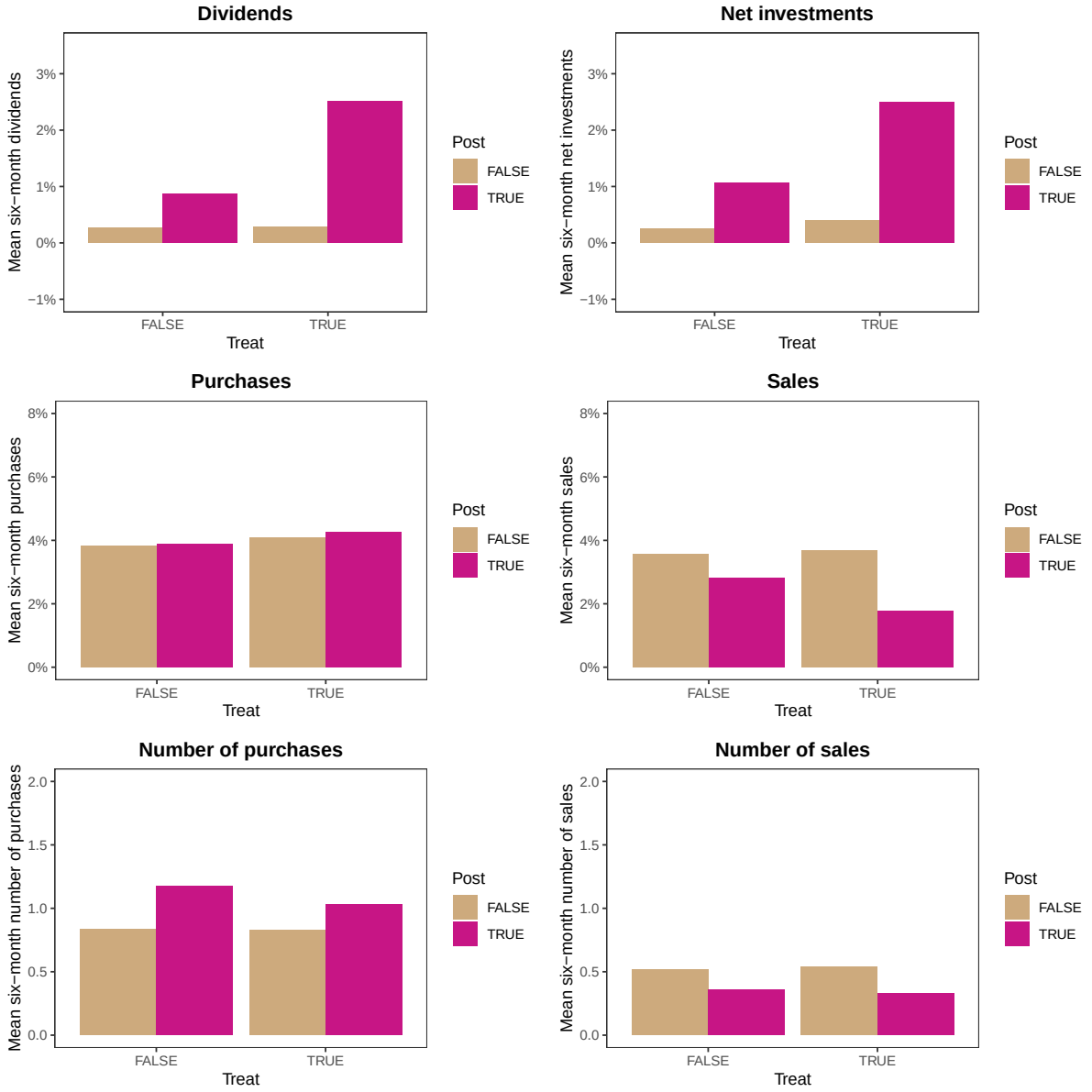
Note: This figure shows developments in account structures and interactions over time. On the left-hand side, the figure shows the share of brokerage accounts that are at institutions at which the household has a checking account or a credit card. On the right-hand side, the figure shows the share of households that make payments or withdrawals from any account that the household has at the institution where the households has its brokerage account. Only households that participate in the stock market, receive dividends, and have a brokerage account are included. On the left-hand side (right-hand side), N = 12,202 (6,315).

Figure 4: German brokerage data: Tracking the flow of dividends



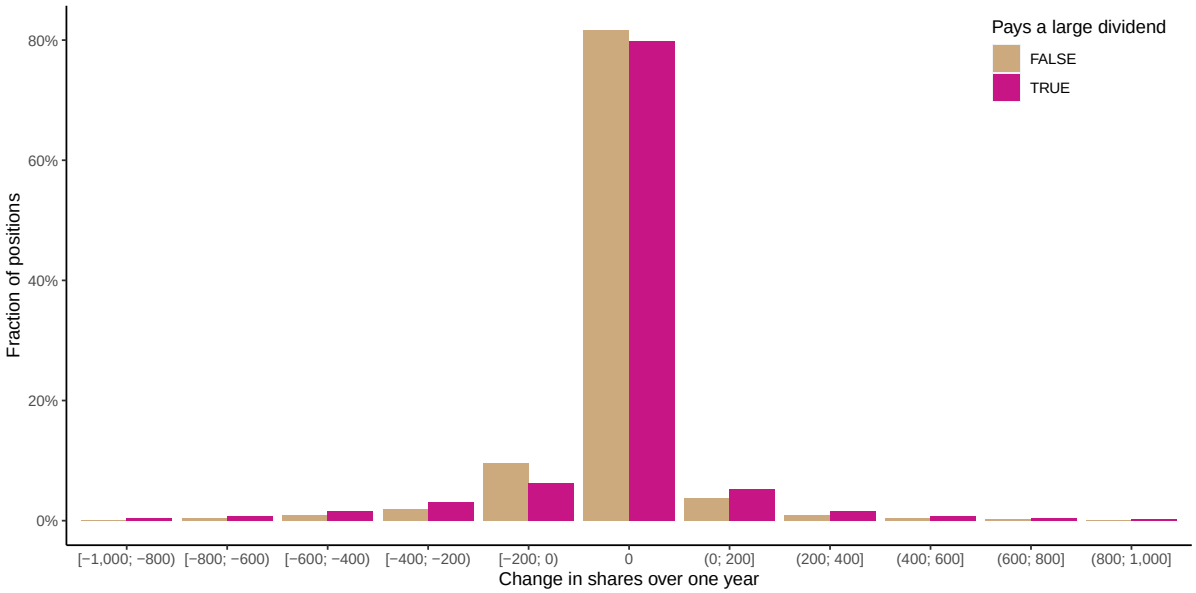
Note: In the top part, this figure shows the share of dividends that is in cash, the share that is withdrawn, and the share that is invested until x months after payment. These shares are calculated by cumulating the respective regression coefficients from Table 4 until x months after payment. In the bottom part, this figure shows the average turnover x months after payment of a dividend. Dividends eligible for automatic reinvestment plans are excluded.

Figure 5: German brokerage data: Dividend initiations



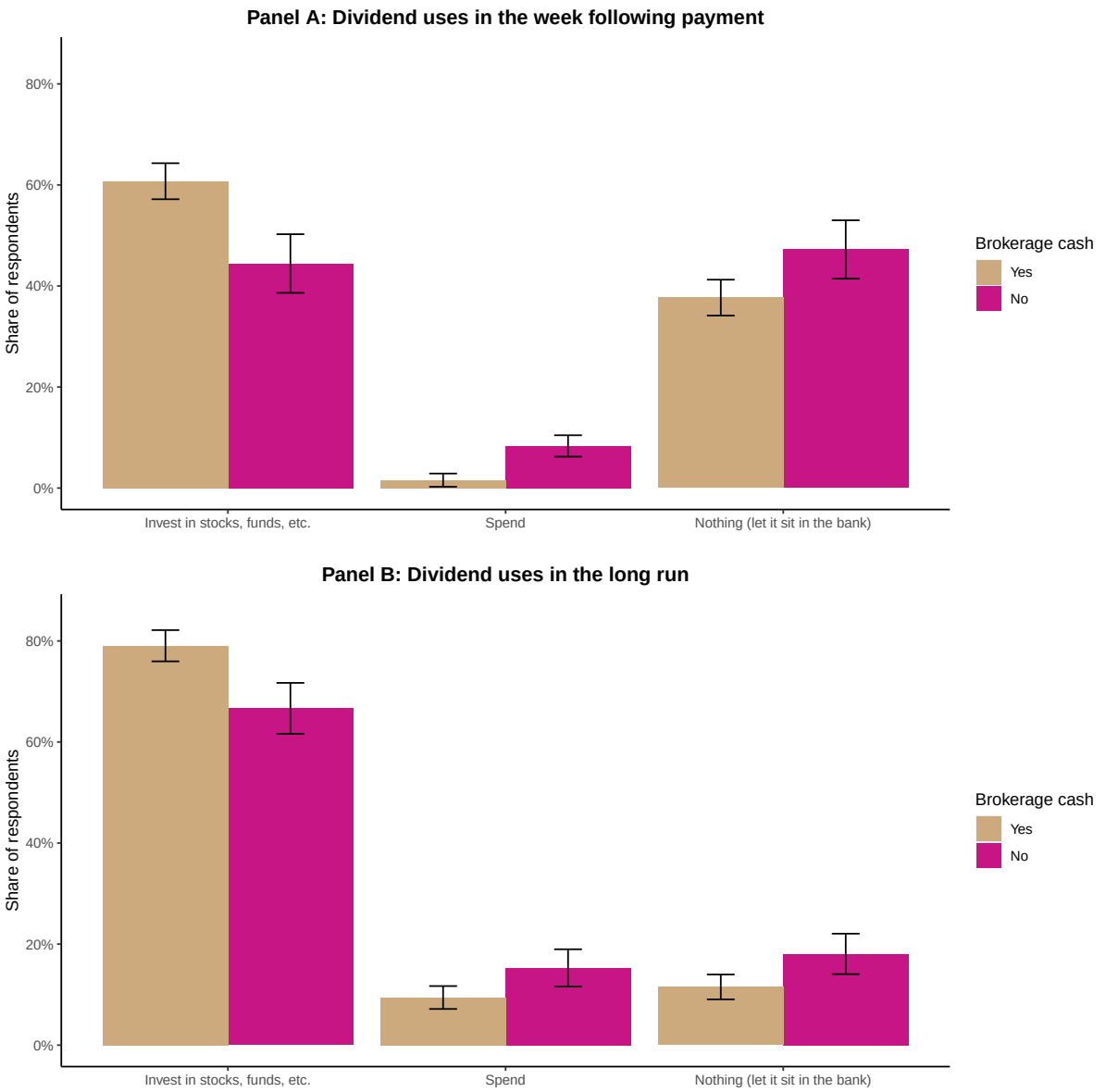
Note: Investor-months are identified in which payments of newly initiated dividends exceed 1% of portfolio value (Treat == TRUE). For such investor-months, dividends, net investments, etc. are cumulated over the six-month period prior to payment (Post == FALSE) and the six-month period following payment (Post == TRUE). Each pair of observations is matched with a pair of observations covering the same time period from a control group of investors that are not paid large newly initiated dividends (Treat == FALSE). The figure shows the mean of the respective variable in each group in each time frame. Dividends eligible for automatic reinvestment plans are excluded. Dividends, net investments, purchases, and sales are scaled by the portfolio value at the beginning of the respective six-month time frame. For statistical tests, see Table C4.

Figure 6: German brokerage data: Reinvestment in the dividend payer



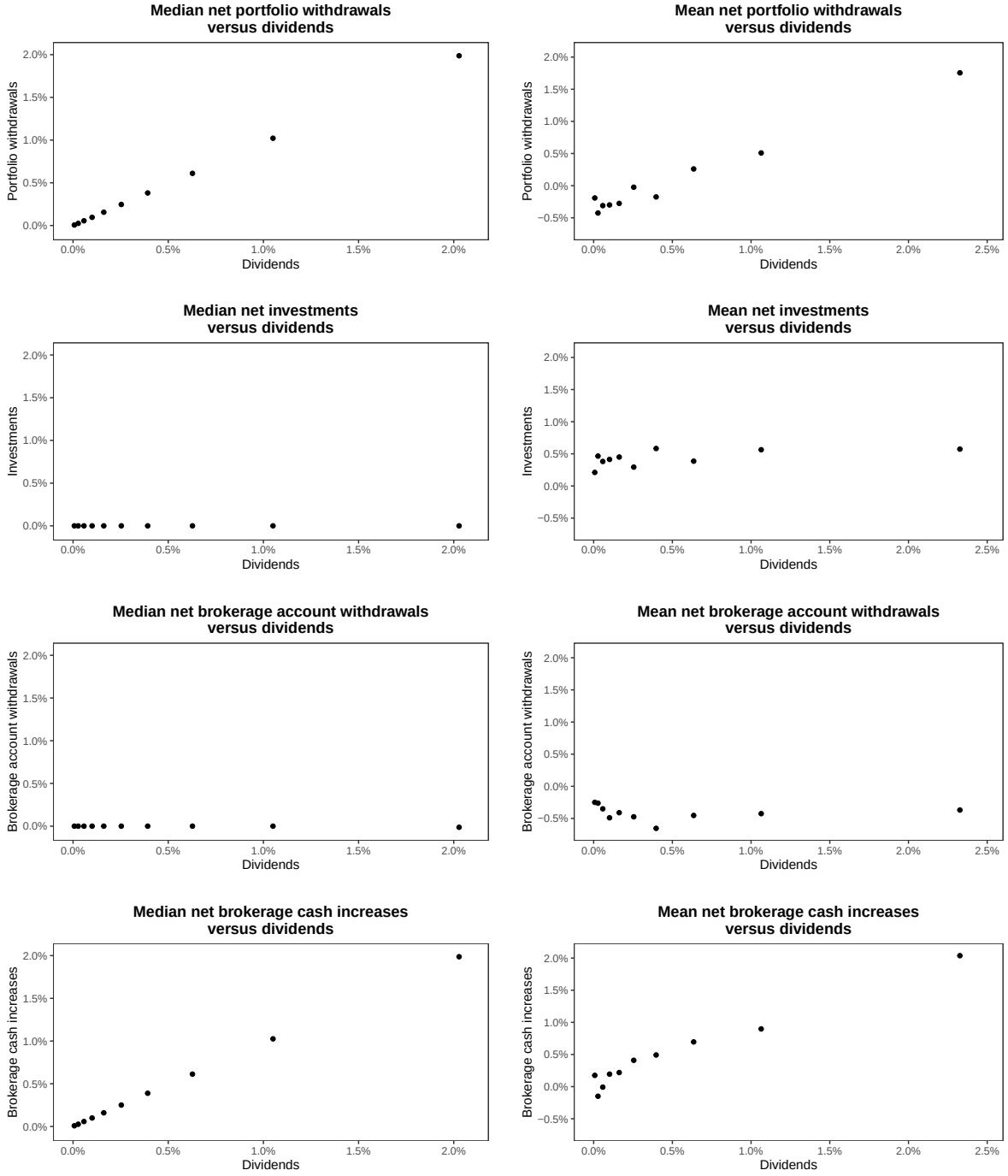
Note: Investor-months are identified in which a position pays a large dividend (i.e., a dividend that exceeds 1% of portfolio value). For the dividend-paying position, the change in shares from the beginning of the month until one year thereafter is calculated. The same is done for the other positions that the investor holds at the beginning of the month, that do not pay a large dividend. For each group of positions (payers vs. non-payers of large dividends), the figure shows the fraction of positions for which the change in shares is in the specified ranges. Positions eligible for automatic investing plans are excluded. Dividends eligible for automatic reinvestment plans are excluded. The number of positions with (without) large dividend payments is 8,229 (31,341).

Figure 7: Online survey: Dividend uses depending on account structure



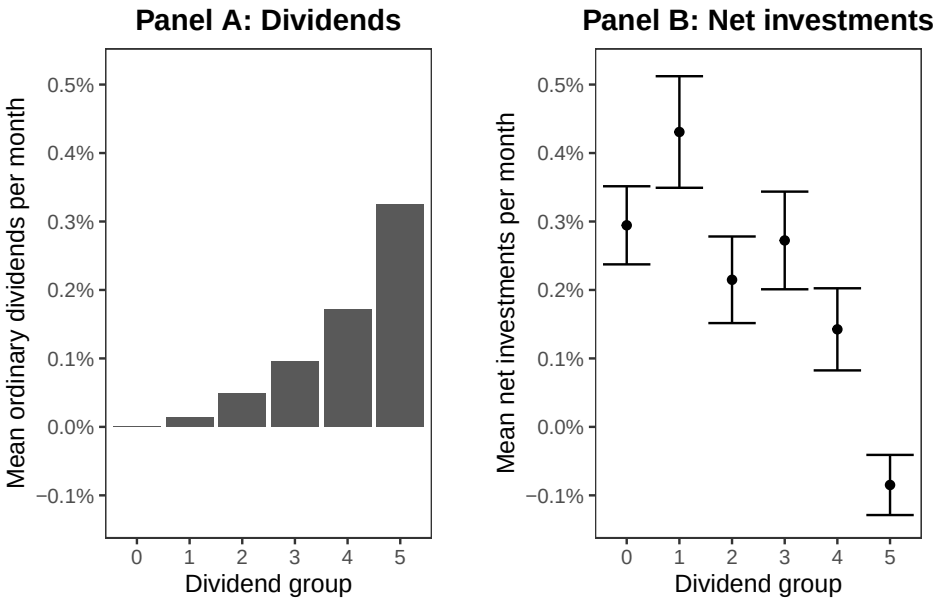
Note: This figure shows mean responses from a survey among 293 stock market investors from Germany and the US. Participants were asked what they primarily did with their past dividends in the first week after payment and in the long run (i.e., until today). Respondents are grouped by having a brokerage account with or without a brokerage cash balance. Details about survey questions and results can be found in Section D of the Internet Appendix. Participants who answered that they have never received a dividend in the past are excluded. Standard error bars are calculated assuming a normal distribution of the mean.

Figure 8: German brokerage data: Portfolio withdrawals are not consumption



Note: For this figure, investor-months with non-zero dividend payments are sorted into deciles based on the amount of dividends received. The data points plotted represent median/mean values of net portfolio withdrawals/securities investments/brokerage account withdrawals/brokerage cash increases and dividends within each decile. Dividends eligible for automatic reinvestment plans are excluded. All variables are scaled by beginning-of-month portfolio value.

Figure 9: US brokerage data: Net investments and dividend yield



Note: Investors are sorted into six groups based on their ordinary dividend yield (five quintiles plus one group for investors with zero dividends). This figure shows mean ordinary dividends and net investments (both scaled by beginning-of-month portfolio value) within each group. Standard errors are clustered by investor and time period. The numbers of observations in groups zero through six are 22,253, 14,517, 15,551, 16,001, 18,338, and 18,546.

Table 1: Consumer Expenditure Survey: Dividend consumption over time

	The dependent variable is total expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
Total return on stocks	-0.010	-0.029	-0.010		-0.031	-0.033
	(0.018)	(0.036)	(0.018)		(0.036)	(0.035)
Zero-dividend dummy	-434	551	-434		459	592
	(644)	(907)	(643)		(906)	(919)
Dividends	0.748***	0.860***	0.748***		0.892***	1.055***
	(0.118)	(0.131)	(0.118)		(0.146)	(0.238)
Dividends * (Year - 1988)		-0.025**			-0.027**	-0.033**
		(0.011)			(0.012)	(0.013)
Dividends * (Year > 2001)			-0.380*			
			(0.199)			
Zero-div-plus-int dummy				799		
				(1,250)		
Div plus int				0.565***		
				(0.115)		
Div plus int * (Year - 1988)				-0.015**		
				(0.006)		
Early adopter					10,965**	11,103**
					(4,393)	(4,406)
Dividends * Early adopter					-0.416**	-0.698*
					(0.203)	(0.363)
Dividends * Age						-0.007
						(0.006)
Sample period	1988 - 2001	1988 - 2012	1988 - 2012	1988 - 2022	1988 - 2012	1988 - 2012
Number of observations	2,719	5,002	5,002	5,541	5,002	5,002
R^2	0.63	0.61	0.61	0.61	0.62	0.62

Note: This table shows the results of regressions of annual total expenditures on annual financial income and interactions of financial income with time-trends and investor characteristics. One observation corresponds to one household that is observed for one year. The zero-dividend dummy (zero-div-plus-int dummy) is one iff the household did not receive dividends (dividends or interest) in two years. The early-adopter dummy is one iff the year is before 1992 and the household owns a personal computer. Age is the age of the household head minus 50. All regressions include the following controls: family size, age, dummies for high school and college education, income other than financial income (contemporaneous and lagged), lagged financial wealth, lagged total wealth, and the share of lagged financial wealth in stocks. Controls also include the squares of these variables (family size, age, income, wealth, stock share), and interactions between them (family size * age, family size * income, family size * wealth, age * education, age * wealth). In regresssions (2) through (6), the controls are also interacted with the respective time trend. All regressions include year-month fixed effects. All monetary variables are in December 2001 US dollars. Standard errors are heteroskedasticity-robust and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 2: Brokerage cash at large German and US brokers

	Brokerage cash available	Brokerage cash replaceable/ repurposable	Brokerage cash w/o payment features is default	Name for brokerage cash	Source
Panel A: German brokers					
ING	Yes	Yes	Yes	Extra-Konto	ing.de/sparen-anlegen/direkt-depot/
Comdirect	Yes	Yes	No	Verrechnungskonto	comdirect.de/ depot/comdirect-depot.html
Flatex	Yes	No	Yes	Cash-Konto	flatexdegiro.com/ de/flatexdegiro-bank/faqs
Trade Republic	Yes	No	Yes	Verrechnungskonto	support.traderepublic.com/ de-de/27-Warum-muss-ich-Geld-einzahlen
S Broker	Yes	Yes	Yes	Verrechnungskonto	sbroker.de/82.0.html
DKB	No	Yes	No	-	bank.dkb.de/privatkunden/ investieren/depot
Panel B: US brokers					
Charles Schwab	Yes	Yes	Yes	Cash & Cash Investments	schwab.com/brokerage
Fidelity	Yes	Yes	Yes	Cash (Core)	fidelity.com/trading/ faqs-about-account
TD Ameritrade	Yes	Yes	Yes	Cash	tdameritrade.com/investment-products/cash-solutions.html
E-Trade	Yes	Yes	Yes	Cash	us.etrade.com/frequently-asked-questions/account-features
Robinhood	Yes	No	Yes	Brokerage Cash/ Buying Power	robinhood.com/us/en/support/ articles/difference-between-cm-and-spending-account/

Note: This table provides an overview of brokerage cash at large German and US brokers. Brokerage cash is the cash position of a brokerage account. The first column shows whether accounts at a broker can have a brokerage cash position. The second column shows whether brokerage cash positions can be replaced by a checking account or extended by payment features (e.g., credit cards). The third column shows whether it is the default that accounts at a broker come with a cash position without payment features. If a broker offers different account types, we provide information on that type which we deem to be the "standard account". All information is based on internet research as of November 07, 2023.

Table 3: German brokerage data: Summary statistics

	Mean	SD	Min	P25	Median	P75	Max	N
A_{t-1} (in EUR 1,000)	64.94	143.24	10.00	21.83	35.15	66.12	13,415.94	200,668
CD_{t-1} (in EUR 1,000)	14.57	55.96	0.00	0.00	0.00	0.00	2,000.00	200,668
$Cash_{t-1}$ (in EUR 1,000)	26.46	60.35	-16.54	2.05	9.86	28.27	2,497.23	200,668
$A_{Stocks,t-1}/A_{t-1}$	45.98	42.24	0.00	0.00	39.02	98.11	100.00	200,668
$A_{Funds,t-1}/A_{t-1}$	53.92	42.26	0.00	0.74	60.78	100.00	100.00	200,668
$A_{Other,t-1}/A_{t-1}$	0.10	0.55	0.00	0.00	0.00	0.00	5.00	200,668
$CshInc_t$	0.32	8.78	-49.98	0.00	0.00	0.84	49.98	200,668
$AccWd_t$	-0.55	7.82	-49.98	-0.72	0.00	0.00	49.98	200,668
$CdInv_t$	0.05	3.25	-49.97	0.00	0.00	0.00	49.98	200,668
Inv_t	0.41	4.63	-49.64	0.00	0.00	0.00	49.99	200,668
$Prch_t$	1.10	4.49	0.00	0.00	0.00	0.00	49.99	200,668
Sls_t	0.69	3.89	0.00	0.00	0.00	0.00	49.90	200,668
D_t	0.13	0.44	0.00	0.00	0.00	0.00	20.89	200,668
$D_{S,t}$	0.11	0.41	0.00	0.00	0.00	0.00	12.71	200,668
$D_{F,t}$	0.02	0.16	0.00	0.00	0.00	0.00	20.89	200,668
$D_{AR,t}$	0.02	0.17	0.00	0.00	0.00	0.00	4.76	200,668
I_t	0.07	0.58	-0.01	0.00	0.00	0.00	39.58	200,668

Note: All variables are on an investor-month basis and in percentage points except where noted otherwise. All cash flow variables are scaled by beginning-of-month portfolio value. Further summary statistics are in Table C2 of the Internet Appendix.

Table 4: German brokerage data: Uses of dividends

	Uses				Purchases and sales	
	CshInc_t	AccWd_t	CdInv_t	Inv_t	Prch_t	Sls_t
Panel A: Averaged dividend lags						
D_t	0.89***	-0.04	0.00	0.15***	0.06	-0.09***
	(0.06)	(0.05)	(0.01)	(0.05)	(0.04)	(0.02)
$\frac{1}{11}\sum_{s=1}^{11}\text{D}_{t-s}$	-0.80***	0.16	-0.01	0.65***	0.23*	-0.42***
	(0.29)	(0.27)	(0.07)	(0.18)	(0.13)	(0.11)
Panel B: Individual dividend lags						
D_t	0.88***	-0.03	0.01	0.15***	0.06*	-0.09***
	(0.06)	(0.05)	(0.01)	(0.05)	(0.04)	(0.02)
D_{t-1}	-0.03	-0.02	-0.01	0.06*	0.02	-0.05*
	(0.05)	(0.04)	(0.01)	(0.04)	(0.03)	(0.02)
D_{t-2}	-0.09	0.07	0.00	0.02	-0.02	-0.04*
	(0.06)	(0.05)	(0.01)	(0.03)	(0.02)	(0.02)
D_{t-3}	-0.12	0.00	0.01	0.10	0.05	-0.06***
	(0.08)	(0.05)	(0.01)	(0.07)	(0.07)	(0.02)
D_{t-4}	-0.14**	0.03	0.00	0.12***	0.06*	-0.06***
	(0.05)	(0.04)	(0.01)	(0.04)	(0.03)	(0.02)
D_{t-5}	-0.09	0.00	0.00	0.09*	0.07	-0.02
	(0.06)	(0.04)	(0.01)	(0.05)	(0.05)	(0.02)
D_{t-6}	-0.12**	0.04	-0.01	0.09*	0.05	-0.03
	(0.05)	(0.04)	(0.01)	(0.05)	(0.04)	(0.02)
D_{t-7}	-0.04	-0.02	0.01	0.04	-0.01	-0.06**
	(0.07)	(0.09)	(0.02)	(0.05)	(0.05)	(0.02)
D_{t-8}	-0.06	0.06	-0.01	0.01	-0.03	-0.04
	(0.05)	(0.05)	(0.01)	(0.03)	(0.02)	(0.03)
D_{t-9}	-0.06	0.01	0.00	0.05	0.01	-0.04***
	(0.04)	(0.04)	(0.01)	(0.03)	(0.03)	(0.01)
D_{t-10}	-0.05	0.01	0.00	0.04	0.02	-0.02
	(0.07)	(0.06)	(0.01)	(0.03)	(0.03)	(0.02)
D_{t-11}	0.00	-0.03	-0.01	0.04	0.02	-0.03
	(0.04)	(0.04)	(0.01)	(0.03)	(0.03)	(0.02)

Note: This table shows estimates of dividend uses in the German brokerage data. One column in one panel corresponds to one regression. The different dividend uses that are available to an investor are regressed on dividends paid to the investor in the current month and the eleven preceding months. In Panel A (B), dividend lags enter the regressions as an average (individually). The different potential dividend uses are: Net brokerage cash increases (CshInc), net brokerage account withdrawals (AccWd), net CD investments (CdInv), and net securities investments (Inv). Net securities investments are also broken down into purchases (Prch) and sales (Sls). Controls include cash flows from other investment income, capital gains over the preceding twelve months, beginning-of-month portfolio value, investor characteristics, and time fixed effects. The reported coefficients are for dividends that are not eligible for automatic reinvestment plans. All cash flows are scaled by beginning-of-month portfolio value. Standard errors are clustered by investor and time period and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. N = 200,668.

Table 5: German brokerage data: Dividend uses by retirees and investors with directly linked checking accounts

	Uses				Purchases and sales	
	CshInc_t	AccWd_t	CdInv_t	Inv_t	Prch_t	Sls_t
D_t	0.91***	-0.06	0.01	0.14***	0.05	-0.08***
	(0.07)	(0.06)	(0.02)	(0.05)	(0.04)	(0.02)
$\frac{1}{11}\sum_{s=1}^{11}\text{D}_{t-s}$	-0.84**	0.27	-0.05	0.62***	0.26*	-0.36***
	(0.34)	(0.30)	(0.06)	(0.19)	(0.15)	(0.12)
Retiree * D_t	-0.09	0.07	-0.03	0.06	0.03	-0.03
	(0.12)	(0.09)	(0.03)	(0.08)	(0.05)	(0.04)
Retiree * $\frac{1}{11}\sum_{s=1}^{11}\text{D}_{t-s}$	0.25	-0.69	0.21	0.22	-0.12	-0.35*
	(0.61)	(0.56)	(0.17)	(0.28)	(0.18)	(0.18)
Check * D_t	-0.85***	1.12***	-0.01	-0.25**	-0.42*	-0.17
	(0.09)	(0.11)	(0.02)	(0.11)	(0.23)	(0.16)
Check * $\frac{1}{11}\sum_{s=1}^{11}\text{D}_{t-s}$	1.01	-0.57	-0.14	-0.29	0.44	0.73
	(0.73)	(1.55)	(0.22)	(1.63)	(0.99)	(0.80)

Note: This table shows estimates of variation in dividend uses between investor groups in the German brokerage data. One column corresponds to one regression. The different dividend uses are regressed on contemporaneous and lagged dividends as well as interactions of these dividends with investor-group dummies. The dependent variables are: Net brokerage cash increases (CshInc), net brokerage account withdrawals (AccWd), net CD investments (CdInv), net securities investments (Inv), securities purchases (Prch), and sales (Sls). The investor groups are retirees and investors whose dividends are paid out to their checking account (Check). Coefficients for the dummies of these investor groups are estimated but not reported. Controls include cash flows from other investment income and capital gains (both also interacted with the investor-group dummies), beginning-of-month portfolio value, investor characteristics, and time fixed effects. The reported coefficients are for dividends that are not eligible for automatic reinvestment plans. All cash flows are scaled by beginning-of-month portfolio value and in percentage points. Standard errors are clustered by investor and time period and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. N = 200,668.

Table 6: US brokerage data: Net portfolio withdrawals of dividends

	Dep. var. is net portfolio withdrawals		
	(1)	(2)	(3)
Intercept	-0.17***	-0.13**	
	(0.05)	(0.05)	
Ret_t	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)
$\frac{1}{11}\sum_{s=1}^{11}\text{Ret}_{t-s}$	0.00	0.00	0.01
	(0.01)	(0.01)	(0.01)
$\text{D}_{Ord,t}$	0.91***	0.86***	0.81***
	(0.06)	(0.16)	(0.16)
$\frac{1}{11}\sum_{s=1}^{11}\text{D}_{Ord,t-s}$	0.20	-1.07***	-1.21***
	(0.16)	(0.39)	(0.38)
$\text{D}_{Spl,t}$	1.06***	1.06***	1.04***
	(0.08)	(0.08)	(0.07)
$\frac{1}{11}\sum_{s=1}^{11}\text{D}_{Spl,t-s}$	-0.36***	-0.31***	-0.54***
	(0.08)	(0.05)	(0.11)
$\text{D}_{Fnd,t}$	0.18**	0.17**	0.16**
	(0.08)	(0.08)	(0.07)
$\frac{1}{11}\sum_{s=1}^{11}\text{D}_{Fnd,t-s}$	0.00	-0.06	0.26
	(0.14)	(0.15)	(0.21)
HighDY		0.53***	0.46***
		(0.11)	(0.12)
HighDY * $\text{D}_{Ord,t}$		-0.08	-0.04
		(0.18)	(0.18)
HighDY * $\frac{1}{11}\sum_{s=1}^{11}\text{D}_{Ord,t-s}$		0.26	0.42
		(0.48)	(0.49)
Additional controls	No	No	Yes

Note: This table shows estimates of net portfolio withdrawals of dividends in the US brokerage data. One column corresponds to one regression. Net portfolio withdrawals are regressed on total returns and dividends paid to the investor in the current month and the eleven preceding months. Dividends are separated by type (ordinary, special, and fund). HighDY is a dummy variable that is one iff an investor is in the top quintile of ordinary dividend yields (among investors with non-zero dividends). The additional controls in column (3) are investors' mean turnover, share of trading months, mean fund share, mean other share, and beginning-of-month portfolio value, as well as time fixed effects. Net portfolio withdrawals, total returns, and dividends are scaled by beginning-of-month portfolio value and expressed in percentage points. Standard errors are clustered by investor and time period and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. N = 105,206.

Table 7: Simulated Swedish data: A bias in imputed dividend consumption

Dependent variable: Consumption					
Wealth group	5-50	50-70	70-90	90-95	95-100
Panel A: Actual data					
Dividends	0.29***	0.31***	0.30***	0.29***	0.30***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Panel B: Data with limited observability					
Dividends	0.72***	0.56***	0.46***	0.38***	0.35***
	(0.04)	(0.01)	(0.02)	(0.02)	(0.01)
Panel C: Data with limited observability, OLS instead of IV					
Dividends	0.72***	0.56***	0.45***	0.38***	0.35***
	(0.04)	(0.01)	(0.02)	(0.02)	(0.01)
Panel D: Data with limited observability, fewer controls					
Dividends	0.53***	0.44***	0.37***	0.32***	0.34***
	(0.10)	(0.03)	(0.02)	(0.02)	(0.02)
Panel E: Data with limited observability, 2006 to 2007					
Dividends	0.63***	0.54***	0.52***	0.40***	0.37***
	(0.05)	(0.03)	(0.05)	(0.03)	(0.02)
Share of obs. with unobs. brokerage cash	72%	36%	32%	24%	22%

Note: This table reports the results of regressions of first differences in consumption on first differences in dividends. Controls are first differences in capital gains, income net of dividends, and lagged financial wealth, as well as time fixed effects. First differences in dividends and capital gains are instrumented by their passive components. In Panel A, variables are calculated from actual data. In Panels B through E, variables are calculated from data subject to limited observability. In Panel C, ordinary least squares regressions (OLS) are used instead of instrumental variable regressions (IV). In Panel D, only controls for capital gains and time fixed effects are included. In Panel E, only observations from 2006 and 2007 are included. The last row reports the share of observations with limited observability in each wealth group. All monetary variables are in SEK 1,000. Standard errors are clustered by household and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. N = 1,400,000 per wealth group in Panels A through D. N = 400,000 per wealth group in Panel E.

Internet Appendix

Section A: Consumer Expenditure Survey

Section B: Examples of brokerage cash

Section C: German brokerage data

Section D: Online survey

Section E: US brokerage data

Section F: Simulated Swedish data

A Consumer Expenditure Survey

Table A1: Consumer Expenditure Survey: Replication of summary statistics from 1988-2001

	N	Mean	P50	P10	P90	Min	Max
Consumption							
Nondurables	3,066	14,589	13,485	6,008	24,347	1,347	76,877
Total	3,066	47,134	43,703	20,116	78,378	4,955	201,559
Wealth							
Financial	3,066	66,256	38,272	5,754	156,338	38	984,165
Total	3,066	153,765	120,271	19,932	320,868	38	1,199,269
Income							
Total	3,066	55,598	51,841	18,863	95,999	49	303,793
Interest	2,867	1,225	144	0	3,562	0	86,391
Dividends	3,066	873	0	0	2,340	0	93,032
Other	2,867	53,403	50,069	16,057	94,219	-13,823	302,238
Capital gains	3,066	403	0	-6,393	9,199	-301,407	181,503
Income components as percent of total income							
Interest	2,867	4.1	0.2	0.0	8.7	-137.1	2,086.4
Dividends	3,066	2.2	0.0	0.0	4.8	-36.4	236.7
Other	2,867	87.9	97.5	66.8	106.2	-13,249.3	3,244.7
Capital gains	3,066	5.7	0.0	-9.6	19.3	-5,216.1	13,397.1
Controls							
Stock share	3,066	61.07	67.84	10.72	100.00	0.05	100.00
Age	3,066	52	49	33	74	21	93
Family size	3,066	2	2	1	4	1	11

Note: In this table, we replicate Table 1 from Baker, Nagel, and Wurgler (2007) using the 1988-2001 CEX sample. Consumption and income variables are on a yearly basis. Wealth variables are lagged by one year. Stock share is the share of financial wealth invested in stocks and is in percentage points. Age is the age of the household head in years. All monetary variables are in December 2001 US dollars.

Table A2: Consumer Expenditure Survey: Replication of regressions in levels from 1988-2001

	Nondurables expenditures				Total expenditures			
	2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8
Total return on stocks	-0.01	-0.01			-0.01	-0.01		
	(0.01)	(0.01)			(0.02)	(0.02)		
Dividends	0.12**	0.13***			0.75***	0.76***		
	(0.05)	(0.05)			(0.12)	(0.15)		
Dividends lagged		-0.03				-0.02		
		(0.05)				(0.12)		
Zero-dividend dummy	-641***	-658***			-434	-446		
	(247)	(248)			(644)	(639)		
Total return			-0.01	-0.01			-0.02	-0.02
			(0.01)	(0.01)			(0.02)	(0.02)
Div plus int			0.06*	0.04			0.49***	0.45***
			(0.03)	(0.03)			(0.11)	(0.12)
Div plus int lagged				0.03				0.09
				(0.03)				(0.10)
Zero-div-plus-int dummy			-838***	-827***			-72	-41
			(301)	(302)			(904)	(903)
Number of observations	2,719	2,719	2,379	2,379	2,719	2,719	2,379	2,379
R^2	0.53	0.53	0.53	0.53	0.63	0.63	0.63	0.63

Note: In this table, we replicate Table 2 from Baker, Nagel, and Wurgler (2007) using the 1988-2001 CEX sample. The table shows the results of regressions of annual expenditures on annual financial income. One observation corresponds to one household that is observed for one year. The zero-dividend dummy (zero-div-plus-int dummy) is one iff the household did not receive dividends (dividends or interest) in two years. All regressions include the following controls: family size, age, dummies for high school and college education, income other than financial income (contemporaneous and lagged), lagged financial wealth, lagged total wealth, and the share of lagged financial wealth in stocks. Controls also include the squares of these variables (family size, age, income, wealth, stock share), and interactions between them (family size * age, family size * income, family size * wealth, age * education, age * wealth). All regressions include year-month fixed effects. All monetary variables are in December 2001 US dollars. Standard errors are heteroskedasticity-robust and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table A3: Consumer Expenditure Survey: Replication of regressions in first differences from 1988-2001

	Nondurables expenditures				Total expenditures			
	3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8
Total return on stocks	-0.002	-0.002			0.008	0.006		
	(0.003)	(0.004)			(0.009)	(0.009)		
Change in dividends	0.020	0.005			0.123**	0.068		
	(0.013)	(0.014)			(0.055)	(0.050)		
Zero-dividend dummy	-259***	-155			-686***	-401		
	(96)	(104)			(258)	(310)		
Change in income less dividends	0.001	0.000			0.027***	0.034***		
	(0.003)	(0.003)			(0.006)	(0.008)		
Total return			-0.004	-0.003			0.003	0.002
			(0.003)	(0.004)			(0.009)	(0.010)
Change in div plus change in int			-0.001	-0.004			0.033	0.030
			(0.010)	(0.010)			(0.036)	(0.040)
Zero-div-plus-int dummy			-307***	-121			-558	-375
			(110)	(142)			(370)	(474)
Change in income less div and int			0.001	0.000			0.029***	0.036***
			(0.003)	(0.003)			(0.007)	(0.009)
Consumption lagged	-0.619***		-0.637***		-0.606***		-0.609***	
	(0.048)		(0.051)		(0.043)		(0.048)	
Number of observations	2,719	2,719	2,379	2,379	2,719	2,719	2,379	2,379
R^2	0.31	0.07	0.32	0.08	0.35	0.08	0.36	0.09

Note: In this table, we replicate Table 3 from Baker, Nagel, and Wurgler (2007) using the 1988-2001 CEX sample. The table shows the results of regressions of first differences in quarterly expenditures on first differences in annual income. First differences in quarterly expenditures are between the fourth and the first quarter of a year. First differences in annual income are between the year ending in the fourth quarter and the year ending in the first quarter of a year. Total returns are from the first to the fourth quarter of a year. The zero-dividend dummy (zero-div-plus-int dummy) is one iff the household did not receive dividends (dividends or interest) in two years. Consumption lagged is consumption in the first quarter of a year. All regressions include the following controls: family size, age, dummies for high school and college education, the squares of family size and age, and interactions between age and family size as well as age and education. All regressions include year-month fixed effects. All monetary variables are in December 2001 US dollars. Standard errors are heteroskedasticity-robust and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

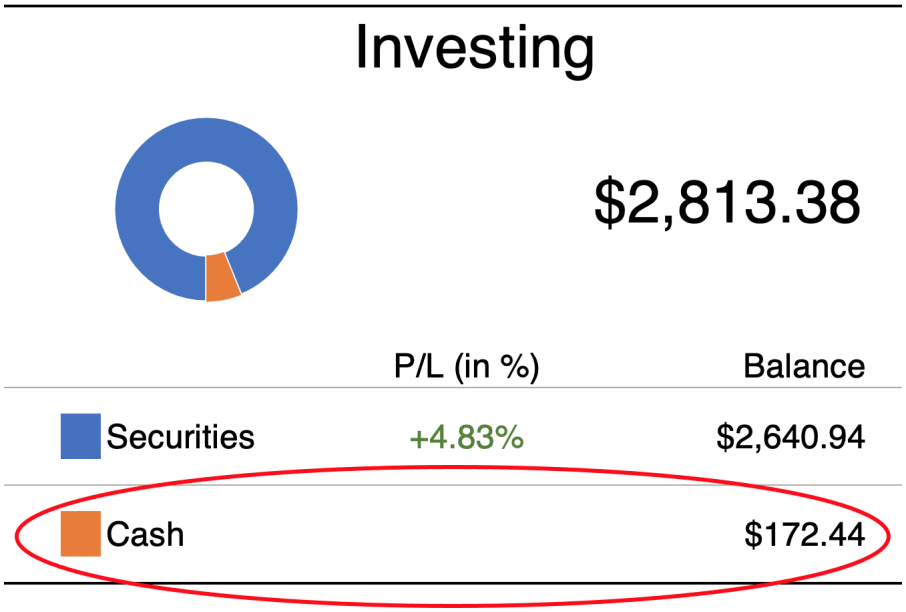
Table A4: Consumer Expenditure Survey: Summary statistics from 1988-2022

	N	Mean	P50	P10	P90	Min	Max
Consumption							
Nondurables	6,280	14,026	12,779	5,707	23,806	766	80,116
Total	6,280	47,784	43,853	20,622	80,004	4,955	201,559
Wealth							
Financial	6,280	109,010	51,365	6,976	279,190	35	1,556,984
Total	6,280	218,423	154,662	26,800	491,812	38	2,001,878
Income							
Total	6,280	56,490	51,884	18,732	100,115	17	303,793
Div plus int	6,072	1,732	139	0	4,881	0	94,804
Interest	5,169	927	85	0	2,436	0	86,391
Dividends	5,377	789	0	0	1,834	0	93,032
Other	6,072	54,771	50,390	16,652	98,664	-13,823	302,238
Capital gains	5,377	-1,337	0	-11,791	10,726	-402,016	181,503
Income components as percent of total income							
Div plus int	6,072	4.1	0.2	0.0	12.7	-2,500.0	2,086.4
Interest	5,169	2.7	0.1	0.0	6.0	-500.0	2,086.4
Dividends	5,377	1.3	0.0	0.0	3.6	-2,000.0	700.0
Other	6,072	94.0	99.5	67.2	109.6	-13,249.3	10,766.4
Capital gains	5,377	3.3	0.0	-16.2	26.7	-10,673.6	13,397.1
Controls							
Stock share	6,280	60.67	69.26	7.58	100.00	0.01	100.00
Age	6,280	54	52	34	76	20	93
Family size	6,280	2	2	1	4	1	11

Note: This table shows summary statistics for the 1988-2022 CEX sample. Consumption and income variables are on a yearly basis. Separate variables for dividends and interest exist only until 2012. Starting in 2013, dividends and interest are recorded jointly in one variable. Data on capital gains are only available until 2012. Wealth variables are lagged by one year. Stock share is the share of financial wealth invested in stocks and is in percentage points. Age is the age of the household head in years. All monetary variables are in December 2001 US dollars.

B Examples of brokerage cash

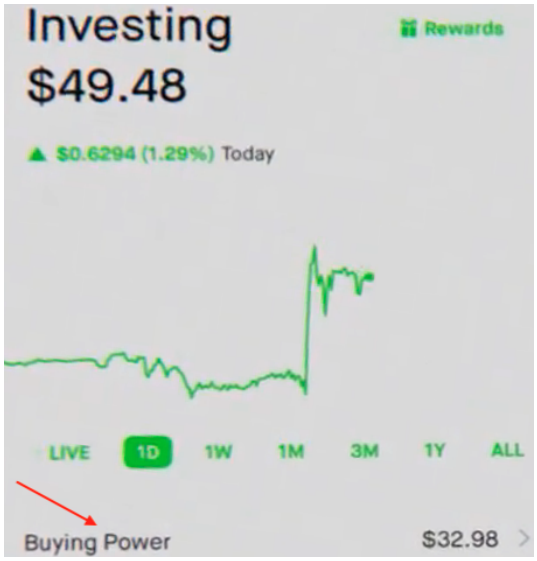
Figure B1: Brokerage cash



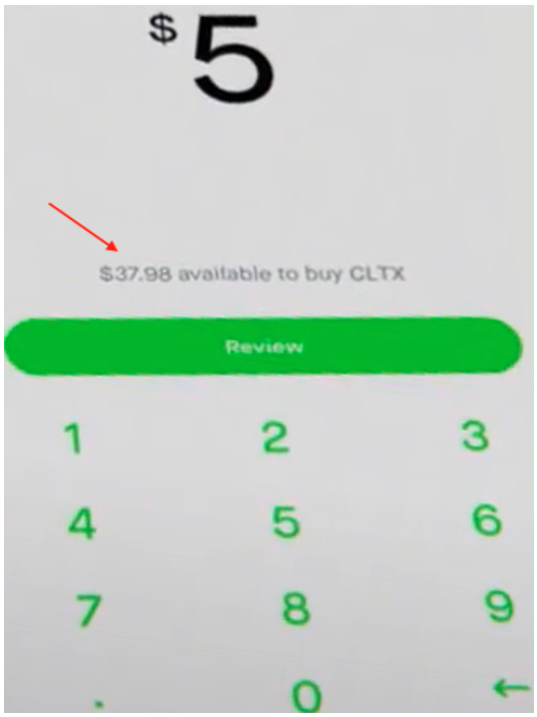
Note: This figure shows a stylized example of brokerage cash. Brokerage cash positions are part of the brokerage account and serve as the link between an outside (reference) bank account and securities investments. If an investor transfers money to his brokerage account to buy securities, the money is added to the brokerage cash balance. In turn, if an investor sells securities or receives dividends, the proceeds are also added to the brokerage cash balance. Brokerage cash positions are generally not designed as bank accounts through which regular payment transactions are cleared (e.g., bills are paid).

Figure B2: Brokerage cash at Robinhood

Panel A: Account summary



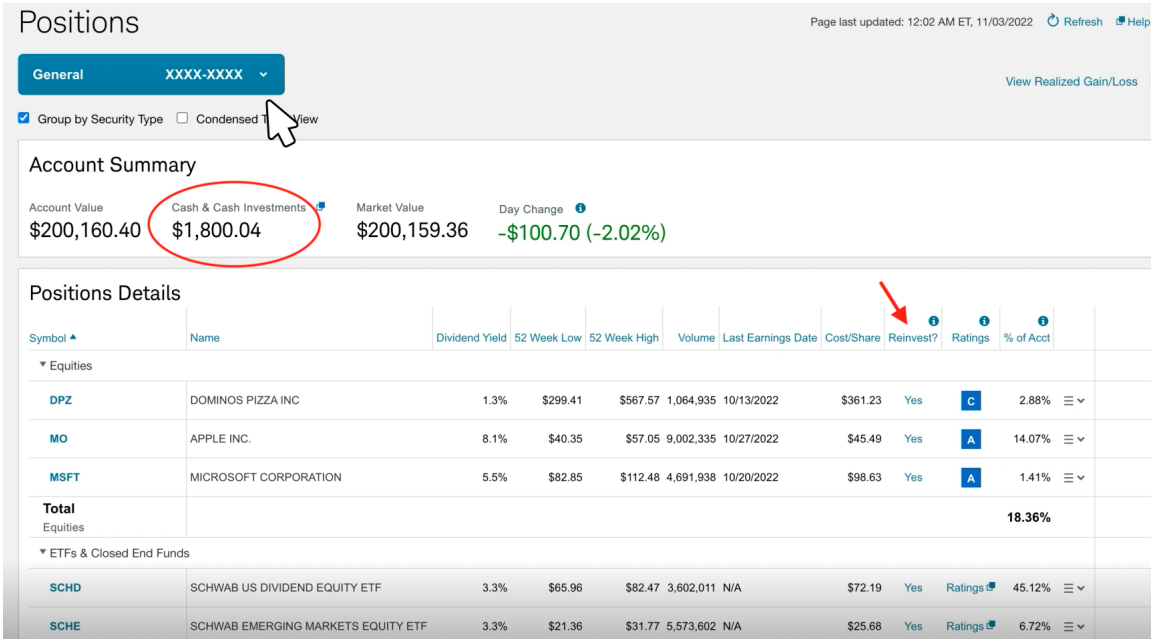
Panel B: Order interface



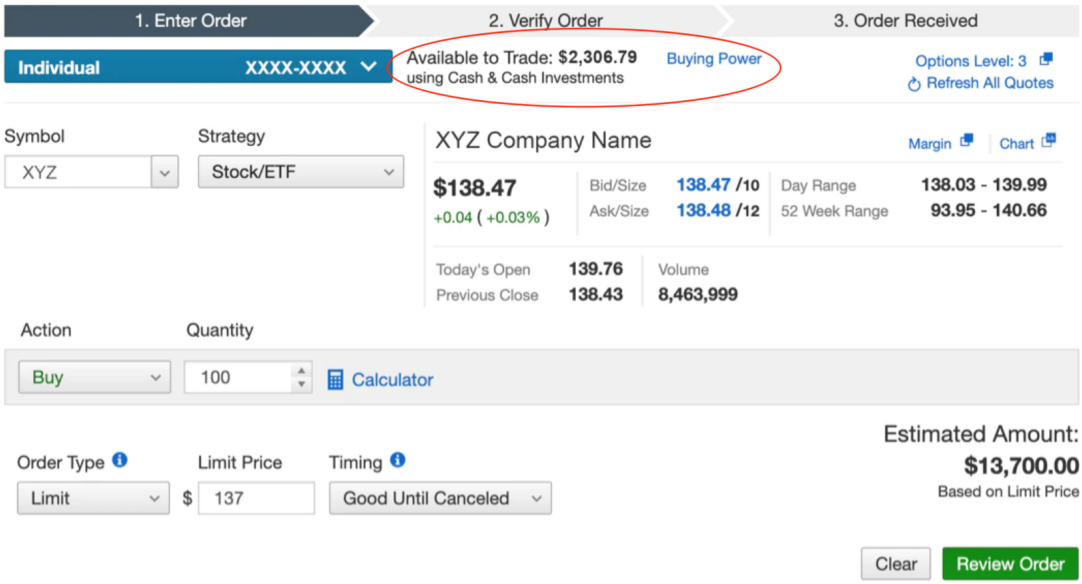
Note: This figure shows screenshots of a brokerage account at Robinhood. The red arrows highlight the brokerage cash balance, a.k.a., buying power. (Note: There may be a small difference between brokerage cash and buying power due to unsettled trades.) The screenshots capture content of the following video (as of December 17, 2022): youtube.com/watch?v=SvKbVp_7AzM.

Figure B3: Brokerage cash at Charles Schwab

Panel A: Positions

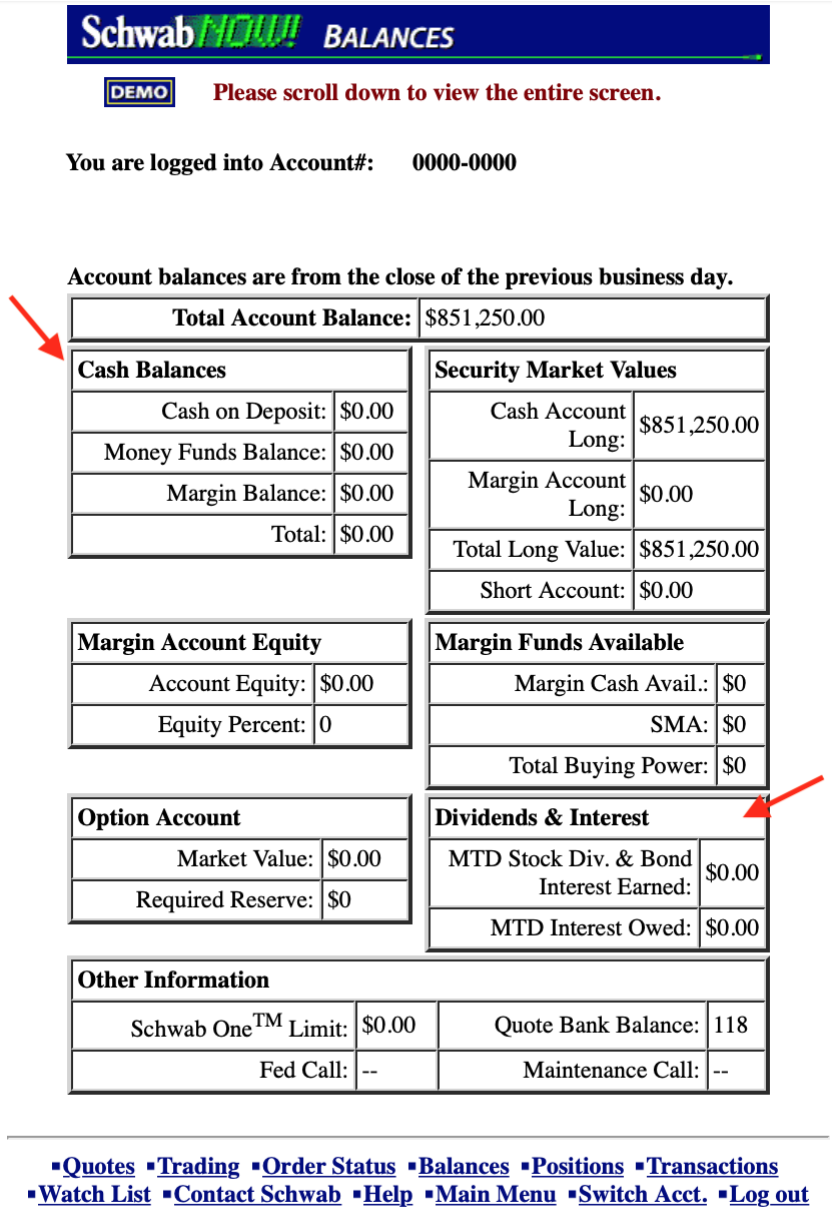


Panel B: Order interface



Note: This figure shows screenshots of a brokerage account at Charles Schwab. The red circles highlight the brokerage cash balance. The red arrow in Panel A highlights an automatic dividend reinvestment feature. The screenshot in Panel A captures content of the following website (as of December 17, 2022): www.schwab.com/content/how-to-reinvest-dividends. The screenshot in Panel B captures content of the following website (as of December 17, 2022): www.schwab.com/stocks.

Figure B4: Demo brokerage account at Charles Schwab in 1996



Schwab NOW! BALANCES

DEMO Please scroll down to view the entire screen.

You are logged into Account#: 0000-0000

Account balances are from the close of the previous business day.

Total Account Balance:	$851,250.00

Cash Balances	
Cash on Deposit:	$0.00
Money Funds Balance:	$0.00
Margin Balance:	$0.00
Total:	$0.00

Security Market Values	
Cash Account Long:	$851,250.00
Margin Account Long:	$0.00
Total Long Value:	$851,250.00
Short Account:	$0.00

Margin Account Equity	
Account Equity:	$0.00
Equity Percent:	0

Margin Funds Available	
Margin Cash Avail.:	$0
SMA:	$0
Total Buying Power:	$0

Option Account	
Market Value:	$0.00
Required Reserve:	$0

Dividends & Interest	
MTD Stock Div. & Bond Interest Earned:	$0.00
MTD Interest Owed:	$0.00

Other Information			
Schwab One™ Limit:	$0.00	Quote Bank Balance:	118
Fed Call:	--	Maintenance Call:	--

▪Quotes ▪Trading ▪Order Status ▪Balances ▪Positions ▪Transactions
▪Watch List ▪Contact Schwab ▪Help ▪Main Menu ▪Switch Acct. ▪Log out

Note: This figure shows a screenshot of a demo account at Charles Schwab in 1996. The top left arrow highlights brokerage cash that is either held as bank deposits or swept in money market funds. The bottom right arrow highlights the amount of dividends received in the current month. The screenshot captures content of the following website (as of December 18, 2022): web.archive.org/web/19970108124047/schwab.com/Trading/demo/html/Start.html.

Figure B5: Demo brokerage account at Ameritrade in 1998

Note: This figure shows a screenshot of a demo account at Ameritrade in 1998. The red arrow highlights the brokerage cash balance, a.k.a., buying power. (Note: There may be a small difference between brokerage cash and buying power due to unsettled trades.) The screenshot captures content of the following website (as of December 17, 2022): web.archive.org/web/19980211224009/http://www.ameritrade.com/demo/mainmenu_demo.html.

C German brokerage data

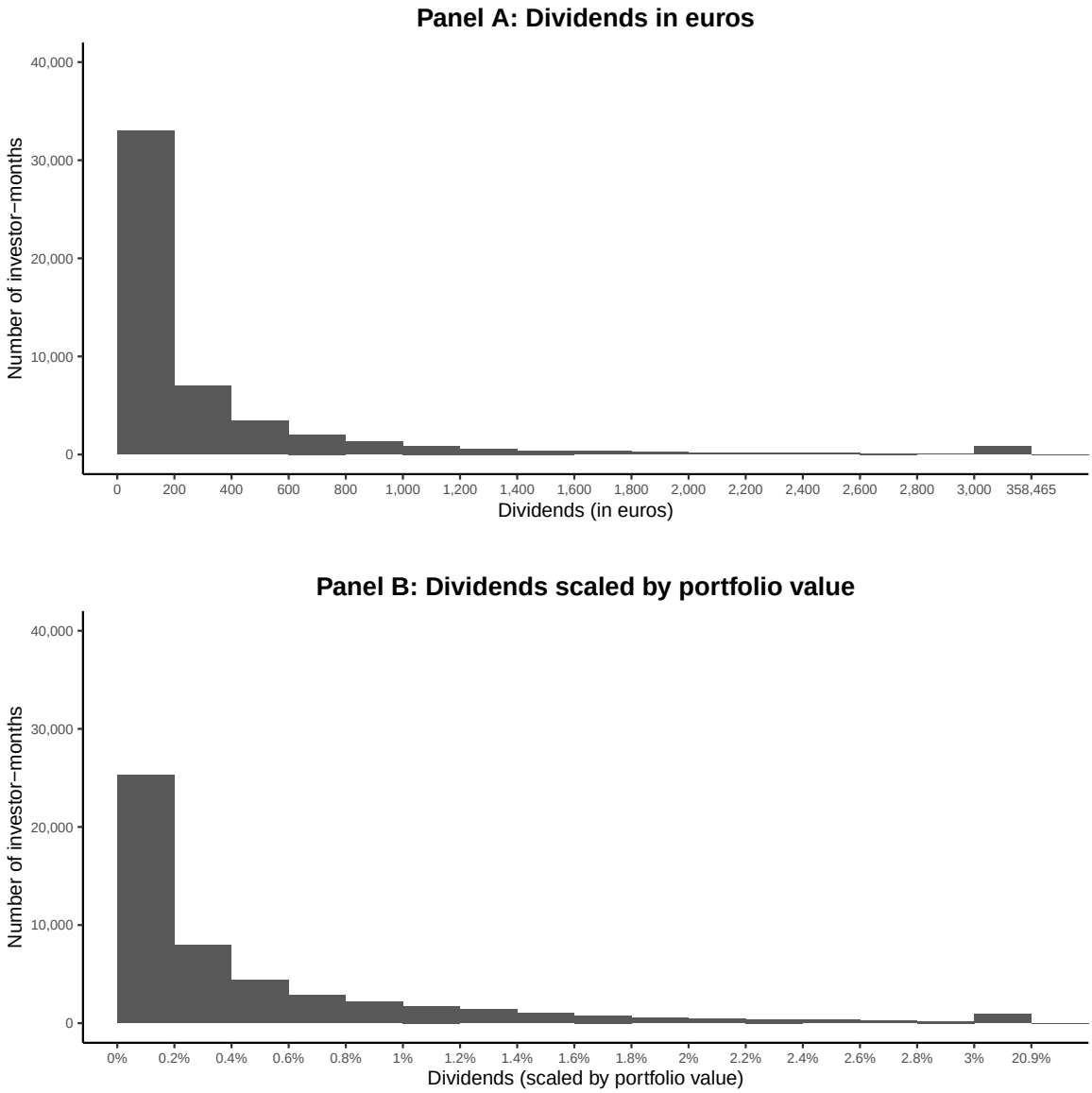
C.1 Tax consideration

Before 2009, dividends paid by German companies are subject to a withholding tax of 21.1%. Dividends paid by foreign companies are not subject to this withholding tax but to foreign withholding taxes that are often of the same order of magnitude as Germany's. Thus, and because German dividends dominate in our dataset, we apply a uniform tax rate of 21.1% to all dividends paid before 2009. Also, before 2009, interest payments are taxed at 31.65% and capital gains are tax-exempt.

After 2009, all dividends paid to German investors, regardless of the paying company's country of residence, are subject to a withholding tax of 26.375%. Foreign dividends are additionally subject to local withholding taxes, which are often offset against the German withholding tax depending on the corresponding double tax treaty. For simplicity, we apply a uniform rate of 26.375% after 2009. This rate is also applicable to interest payments and realized capital gains of assets purchased after 2009. We ignore church taxes as they are not regularly withheld by banks prior to 2015.

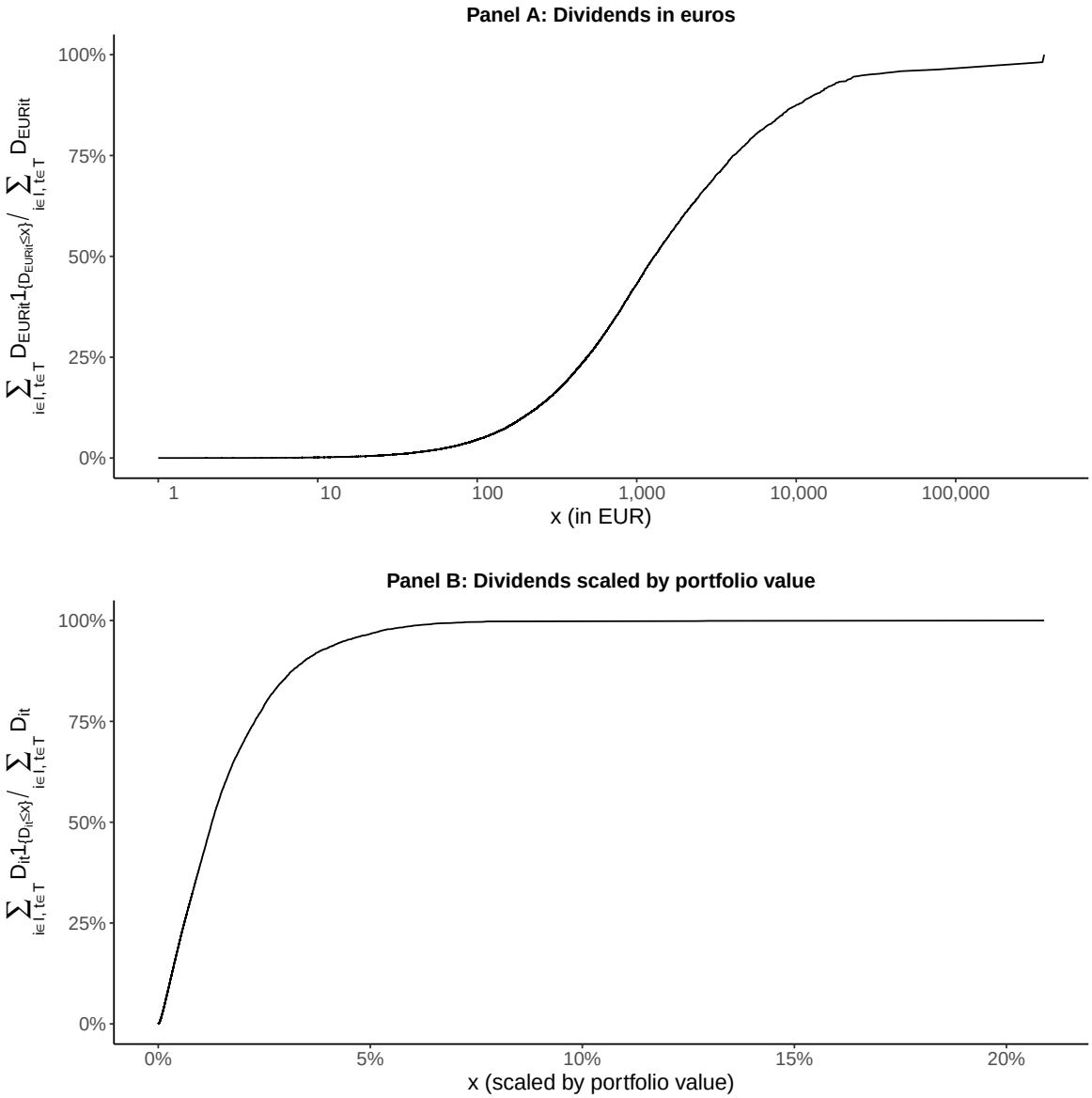
Investors receive a yearly allowance for tax-free dividends, interest payments and, after 2009, capital gains. Before (after) 2009, this allowance can take on a maximum of EUR 750 (EUR 801) per year for individuals and EUR 1,500 (EUR 1,602) per year for married investors. To use this allowance, an investor has to tell the bank how much of the allowance he would like to use at that bank. As our dataset does not contain explicit information on allowances used, we have to make an assumption regarding their use. Based on the net amounts of dividends and interest payments that we observe in cash balances, we assume that investors allocate half of their allowance to the brokerage accounts in our dataset.

Figure C1: German brokerage data: Histograms of dividend payment sizes



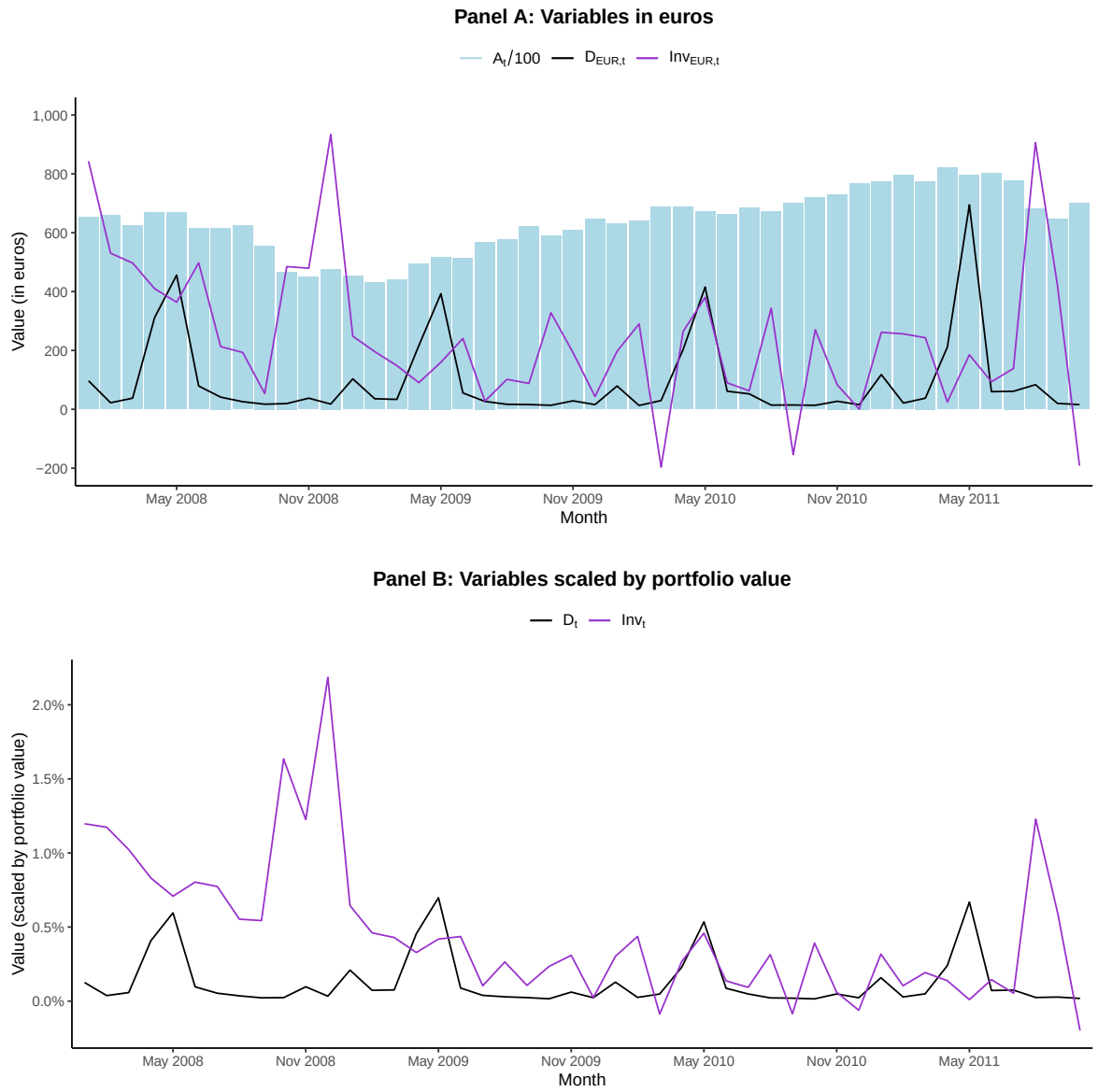
Note: This figure shows histograms of dividend payment sizes across investor-months with positive dividend payments. In Panel A, dividends are in euros. In Panel B, dividends are scaled by beginning-of-month portfolio value. Dividends eligible for automatic reinvestment plans are excluded.

Figure C2: German brokerage data: Cumulative distributions of dividend payment sizes



Note: This figure shows the share of dividends that are accounted for by investor-months in which dividends are smaller than or equal to a certain level x. In Panel A, dividends are in euros. In Panel B, dividends are scaled by beginning-of-month portfolio value. The x-axis of Panel A is scaled logarithmically. Dividends eligible for automatic reinvestment plans are excluded.

Figure C3: German brokerage data: Time variation in dividends, net investments, and portfolio values



Note: This figure shows cross-sectional averages of dividends, net investments, and portfolio values over time. In Panel A, dividends and net investments are in euros (and assets are divided by 100 for scale). In Panel B, dividends and net investments are scaled by beginning-of-month portfolio value. Dividends eligible for automatic reinvestment plans are excluded.

Table C1: German brokerage data: Variable descriptions

Variable	Description
	Panel A: Balances
A_t	EUR value of an investor's security portfolio in month t.
$A_{k,t}$	EUR value of a subset k of an investor's security portfolio in month t.
CD_t	EUR value of an investor's certificates of deposit in month t.
$Cash_t$	EUR value of an investor's brokerage cash balance in month t.
Num Pos_t	Number of positions in an investor's security portfolio in month t.
	Panel B: Flows
$CshInc_t$	EUR value of net increases of an investor's brokerage cash in month t divided by the EUR value of the investor's security portfolio in month t-1.
$AccWd_t$	EUR value of net withdrawals from an investor's brokerage account in month t divided by the EUR value of the investor's security portfolio in month t-1.
$CdInv_t$	EUR value of net investments into certificates of deposit in month t divided by the EUR value of the investor's security portfolio in month t-1.
Inv_t	EUR value of net investments in the investor's security portfolio in month t divided by the EUR value of the investor's security portfolio in month t-1.
$Prch_t$	EUR value of an investor's security purchases in month t divided by the EUR value of the investor's security portfolio in month t-1.
Sls_t	EUR value of an investor's security sales in month t divided by the EUR value of the investor's security portfolio in month t-1.
D_t	EUR value of dividends received by an investor in month t divided by the EUR value of the investor's security portfolio in month t-1. Dividends eligible for automatic reinvestment are excluded.
$D_{S,t}$	EUR value of dividends paid by stocks to an investor in month t divided by the EUR value of the investor's security portfolio in month t-1. Dividends eligible for automatic reinvestment are excluded.
$D_{F,t}$	EUR value of fund dividends received by an investor in month t divided by the EUR value of the investor's security portfolio in month t-1. Dividends eligible for automatic reinvestment are excluded.
$D_{AR,t}$	EUR value of fund dividends eligible for automatic reinvestment received by an investor in month t divided by the EUR value of the investor's security portfolio in month t-1.
I_t	EUR value of interest paid on an investor's brokerage cash balance in month t divided by the EUR value of the investor's security portfolio in month t-1.
$PfWd_t$	EUR value of net withdrawals from an investor's security portfolio in month t divided by the EUR value of the investor's security portfolio in month t-1.
Num $Prch_t$	Number of purchases by an investor in month t.
Num Sls_t	Number of sales by an investor in month t.
	Panel C: Investor characteristics
Check	Dummy that is one iff an investor does not have a brokerage cash balance and instead has his checking account linked to his brokerage account.
Age	Age of the primary accountholder as of December 2007.
Sex	Variable indicating whether the accountholder is male, female, or more than one person.
Married	Dummy that is one iff an investor is married.
Profession	Occupation (white collar, blue collar, civil servant, homemaker, retiree, or unknown).
Financially inexperienced	Dummy that is one iff an investor reports to be financially inexperienced.
Account tenure	The time difference between an investor's account opening and October 2011.
AR status	Variable indicating an investor's usage of the automatic dividend reinvestment plan (uses, opts out, or cannot say because the investor does not receive eligible dividends).
Mean turnover	Average of an investor's average $Prch_t$ and Sls_t.
Share of trading months	Share of months in which an investor makes at least one trade.

Table C2: German brokerage data: Extended summary statistics

	Mean	SD	Min	P25	Median	P75	Max	N
Panel A: Full sample								
Investor-month level								
A_{t-1} (in EUR 1,000)	64.94	143.24	10.00	21.83	35.15	66.12	13,415.94	200,668
CD_{t-1} (in EUR 1,000)	14.57	55.96	0.00	0.00	0.00	0.00	2,000.00	200,668
$Cash_{t-1}$ (in EUR 1,000)	26.46	60.35	-16.54	2.05	9.86	28.27	2,497.23	200,668
$A_{Stocks,t-1}/A_{t-1}$	45.98	42.24	0.00	0.00	39.02	98.11	100.00	200,668
$A_{Funds,t-1}/A_{t-1}$	53.92	42.26	0.00	0.74	60.78	100.00	100.00	200,668
$A_{Other,t-1}/A_{t-1}$	0.10	0.55	0.00	0.00	0.00	0.00	5.00	200,668
Num Pos_{t-1} (in 1)	9.05	8.11	1.00	4.00	7.00	12.00	157.00	200,668
Num $Prch_t$ (in 1)	0.46	1.25	0.00	0.00	0.00	0.00	39.00	200,668
Num Sls_t (in 1)	0.10	0.51	0.00	0.00	0.00	0.00	23.00	200,668
$CshInc_t$	0.32	8.78	-49.98	0.00	0.00	0.84	49.98	200,668
$AccWd_t$	-0.55	7.82	-49.98	-0.72	0.00	0.00	49.98	200,668
$CdInv_t$	0.05	3.25	-49.97	0.00	0.00	0.00	49.98	200,668
Inv_t	0.41	4.63	-49.64	0.00	0.00	0.00	49.99	200,668
$Prch_t$	1.10	4.49	0.00	0.00	0.00	0.00	49.99	200,668
Sls_t	0.69	3.89	0.00	0.00	0.00	0.00	49.90	200,668
$PfWd_t$	-0.26	4.64	-49.99	0.00	0.00	0.02	49.78	200,668
D_t	0.13	0.44	0.00	0.00	0.00	0.00	20.89	200,668
$D_{S,t}$	0.11	0.41	0.00	0.00	0.00	0.00	12.71	200,668
$D_{F,t}$	0.02	0.16	0.00	0.00	0.00	0.00	20.89	200,668
$D_{AR,t}$	0.02	0.17	0.00	0.00	0.00	0.00	4.76	200,668
I_t	0.07	0.58	-0.01	0.00	0.00	0.00	39.58	200,668
Investor level								
Age (in years)	54.41	14.82	1.00	45.00	54.00	66.00	99.00	6,693
Sex: Shared account	29.09	45.42	0.00	0.00	0.00	100.00	100.00	6,693
Sex: Male	50.32	50.00	0.00	0.00	100.00	100.00	100.00	6,693
Sex: Female	20.59	40.44	0.00	0.00	0.00	0.00	100.00	6,693
Married	63.22	48.23	0.00	0.00	100.00	100.00	100.00	6,693
Profession: White collar	45.66	49.81	0.00	0.00	0.00	100.00	100.00	6,693
Profession: Blue collar	4.08	19.78	0.00	0.00	0.00	0.00	100.00	6,693
Profession: Civil servant	8.68	28.16	0.00	0.00	0.00	0.00	100.00	6,693
Profession: Homemaker	2.18	14.61	0.00	0.00	0.00	0.00	100.00	6,693
Profession: Retiree	14.90	35.61	0.00	0.00	0.00	0.00	100.00	6,693
Profession: Unknown	24.50	43.01	0.00	0.00	0.00	0.00	100.00	6,693
Financially inexperienced	8.35	27.67	0.00	0.00	0.00	0.00	100.00	6,693
Account tenure (in years)	6.79	3.12	1.00	4.83	6.33	8.42	16.83	6,693
AR status: Uses	24.07	42.75	0.00	0.00	0.00	0.00	100.00	6,693
AR status: Opts out	1.69	12.88	0.00	0.00	0.00	0.00	100.00	6,693
AR status: Cannot say	74.24	43.73	0.00	0.00	100.00	100.00	100.00	6,693
Mean A_t (in EUR 1,000)	67.58	200.68	10.04	22.98	36.74	67.63	13,233.87	6,693
Mean $Cash_t/(Cash_t+A_t)$	26.73	21.73	-0.01	8.66	21.28	40.25	95.93	6,693
Mean $CshInc_t$	0.19	3.55	-44.90	-0.55	0.05	0.96	45.69	6,693
Mean $AccWd_t$	-0.62	3.19	-47.50	-1.44	-0.22	0.37	28.88	6,693
Mean $CdInv_t$	0.05	1.09	-21.34	0.00	0.00	0.00	44.27	6,693
Mean Inv_t	0.60	2.57	-20.65	0.00	0.06	0.88	49.99	6,693
Mean $Prch_t$	1.61	3.55	0.00	0.00	0.36	1.62	49.99	6,693
Mean Sls_t	1.01	2.78	0.00	0.00	0.01	0.80	41.15	6,693
Mean $PfWd_t$	-0.45	2.58	-49.99	-0.73	0.00	0.21	20.85	6,693
Mean D_t	0.13	0.15	0.00	0.01	0.10	0.20	5.93	6,693
Mean turnover	1.31	2.92	0.00	0.01	0.36	1.19	39.98	6,693
Share of trading months	26.65	32.30	0.00	2.63	12.50	36.96	100.00	6,693

(continued on next page...)

Table C2: German brokerage data: Extended summary statistics *(continued)*

	Mean	SD	Min	P25	Median	P75	Max	N
Panel B: Investors with directly linked checking accounts								
Investor-month level								
A_{t-1} (in EUR 1,000)	52.87	37.99	10.36	21.26	45.15	66.62	167.11	588
CD_{t-1} (in EUR 1,000)	1.17	3.97	0.00	0.00	0.00	0.00	25.00	588
$Cash_{t-1}$ (in EUR 1,000)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	588
$A_{Stocks,t-1}/A_{t-1}$	55.92	42.47	0.00	7.23	71.23	100.00	100.00	588
$A_{Funds,t-1}/A_{t-1}$	44.00	42.42	0.00	0.00	28.77	92.77	100.00	588
$A_{Other,t-1}/A_{t-1}$	0.08	0.41	0.00	0.00	0.00	0.00	3.49	588
Num Pos_{t-1} (in 1)	7.88	5.84	1.00	4.00	5.00	13.00	22.00	588
Num $Prch_t$ (in 1)	0.56	0.97	0.00	0.00	0.00	1.00	4.00	588
Num Sls_t (in 1)	0.08	0.36	0.00	0.00	0.00	0.00	5.00	588
$CshInc_t$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	588
$AccWd_t$	-0.49	4.82	-43.36	-0.16	0.00	0.02	33.78	588
$CdInv_t$	0.01	0.17	0.00	0.00	0.00	0.00	2.33	588
Inv_t	0.63	4.79	-33.78	0.00	0.00	0.17	43.50	588
$Prch_t$	1.46	5.12	0.00	0.00	0.00	0.20	43.96	588
Sls_t	0.82	4.34	0.00	0.00	0.00	0.00	43.57	588
$PfWd_t$	-0.48	4.82	-43.36	-0.16	0.00	0.02	33.78	588
D_t	0.14	0.47	0.00	0.00	0.00	0.01	3.80	588
$D_{S,t}$	0.12	0.43	0.00	0.00	0.00	0.01	3.80	588
$D_{F,t}$	0.02	0.20	0.00	0.00	0.00	0.00	3.13	588
$D_{AR,t}$	0.02	0.12	0.00	0.00	0.00	0.00	1.55	588
I_t	0.00	0.00	0.00	0.00	0.00	0.00	0.00	588
Investor level								
Age (in years)	53.08	14.12	29.00	43.00	57.00	61.00	79.00	25
Sex: Shared account	36.00	48.99	0.00	0.00	0.00	100.00	100.00	25
Sex: Male	40.00	50.00	0.00	0.00	0.00	100.00	100.00	25
Sex: Female	24.00	43.59	0.00	0.00	0.00	0.00	100.00	25
Married	80.00	40.82	0.00	100.00	100.00	100.00	100.00	25
Profession: White collar	52.00	50.99	0.00	0.00	100.00	100.00	100.00	25
Profession: Blue collar	8.00	27.69	0.00	0.00	0.00	0.00	100.00	25
Profession: Civil servant	8.00	27.69	0.00	0.00	0.00	0.00	100.00	25
Profession: Homemaker	4.00	20.00	0.00	0.00	0.00	0.00	100.00	25
Profession: Retiree	12.00	33.17	0.00	0.00	0.00	0.00	100.00	25
Profession: Unknown	16.00	37.42	0.00	0.00	0.00	0.00	100.00	25
Financially inexperienced	12.00	33.17	0.00	0.00	0.00	0.00	100.00	25
Account tenure (in years)	6.32	4.48	1.25	2.67	3.92	11.17	15.25	25
AR status: Uses	16.00	37.42	0.00	0.00	0.00	0.00	100.00	25
AR status: Opts out	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25
AR status: Cannot say	84.00	37.42	0.00	100.00	100.00	100.00	100.00	25
Mean A_t (in EUR 1,000)	46.22	36.25	10.43	21.40	31.12	59.34	136.91	25
Mean $Cash_t/(Cash_t+A_t)$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25
Mean $CshInc_t$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25
Mean $AccWd_t$	-0.35	0.80	-2.78	-0.61	0.00	0.20	0.42	25
Mean $CdInv_t$	0.01	0.04	0.00	0.00	0.00	0.00	0.18	25
Mean Inv_t	0.50	0.79	-0.12	0.00	0.08	0.69	2.96	25
Mean $Prch_t$	1.27	2.66	0.00	0.00	0.21	1.24	12.55	25
Mean Sls_t	0.77	2.21	0.00	0.00	0.01	0.32	10.43	25
Mean $PfWd_t$	-0.34	0.79	-2.78	-0.58	0.00	0.20	0.42	25
Mean D_t	0.15	0.13	0.00	0.03	0.11	0.24	0.42	25
Mean turnover	1.02	2.42	0.00	0.00	0.26	0.62	11.49	25
Share of trading months	29.45	36.04	0.00	0.00	13.89	42.22	100.00	25

Note: All variables are on an investor-month basis and in percentage points except where noted otherwise. All cash flow variables are scaled by beginning-of-month portfolio value.

Table C3: German brokerage data: Uses of dividends with investor fixed effects

	Uses				Purchases and sales	
	CshInc_t	AccWd_t	CdInv_t	Inv_t	Prch_t	Sls_t
Panel A: Averaged dividend lags						
D_t	0.84***	-0.03	0.02	0.18***	0.06	-0.12***
	(0.07)	(0.05)	(0.01)	(0.05)	(0.04)	(0.03)
$\frac{1}{11}\sum_{s=1}^{11}\text{D}_{t-s}$	-1.10***	0.11	0.15	0.83**	0.16	-0.67***
	(0.39)	(0.35)	(0.11)	(0.33)	(0.29)	(0.20)
Panel B: Individual dividend lags						
D_t	0.82***	-0.02	0.02	0.18***	0.06	-0.12***
	(0.07)	(0.05)	(0.01)	(0.05)	(0.04)	(0.03)
D_{t-1}	-0.08	-0.01	0.01	0.08**	0.01	-0.07**
	(0.05)	(0.05)	(0.01)	(0.04)	(0.03)	(0.03)
D_{t-2}	-0.13**	0.09*	0.01	0.03	-0.03	-0.07**
	(0.05)	(0.05)	(0.01)	(0.03)	(0.03)	(0.03)
D_{t-3}	-0.16*	0.01	0.03*	0.12	0.04	-0.08***
	(0.08)	(0.05)	(0.02)	(0.08)	(0.07)	(0.03)
D_{t-4}	-0.18***	0.04	0.01	0.13***	0.04	-0.08***
	(0.06)	(0.04)	(0.01)	(0.05)	(0.04)	(0.02)
D_{t-5}	-0.11	0.00	0.01	0.09	0.06	-0.03
	(0.07)	(0.05)	(0.01)	(0.06)	(0.07)	(0.02)
D_{t-6}	-0.14**	0.03	0.01	0.11*	0.05	-0.06**
	(0.06)	(0.05)	(0.01)	(0.06)	(0.05)	(0.03)
D_{t-7}	-0.07	-0.04	0.03	0.08	-0.01	-0.09***
	(0.07)	(0.09)	(0.02)	(0.05)	(0.05)	(0.02)
D_{t-8}	-0.10	0.04	0.00	0.05	-0.02	-0.07**
	(0.06)	(0.05)	(0.01)	(0.04)	(0.03)	(0.03)
D_{t-9}	-0.10**	0.00	0.02	0.08**	0.01	-0.07***
	(0.04)	(0.04)	(0.01)	(0.03)	(0.03)	(0.02)
D_{t-10}	-0.08	0.01	0.02*	0.05	0.01	-0.04
	(0.08)	(0.07)	(0.01)	(0.03)	(0.03)	(0.03)
D_{t-11}	-0.03	-0.04	0.01	0.06**	0.01	-0.05*
	(0.05)	(0.04)	(0.01)	(0.03)	(0.03)	(0.03)

Note: This table shows estimates of dividend uses in the German brokerage data. One column in one panel corresponds to one regression. The different dividend uses that are available to an investor are regressed on dividends paid to the investor in the current month and the eleven preceding months. In Panel A (B), dividend lags enter the regressions as an average (individually). The different potential dividend uses are: Net brokerage cash increases (CshInc), net brokerage account withdrawals (AccWd), net CD investments (CdInv), and net securities investments (Inv). Net securities investments are also broken down into purchases (Prch) and sales (Sls). Controls include cash flows from other investment income, capital gains over the preceding twelve months, one over beginning-of-month portfolio value, investor fixed effects, and time fixed effects. The reported coefficients are for dividends that are not eligible for automatic reinvestment plans. All cash flows are scaled by beginning-of-month portfolio value. Standard errors are clustered by investor and time period and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. N = 200,668.

Table C4: German brokerage data: Dividend initiations

	Inv	Prch	Sls	Num Prch	Num Sls
Intercept	0.14	3.71***	3.57***	0.84***	0.51***
	(0.39)	(0.40)	(0.36)	(0.19)	(0.07)
Divs	0.93***	0.31	-0.62***		
	(0.28)	(0.26)	(0.14)		
Post				0.34***	-0.15**
				(0.09)	(0.06)
Treat				-0.01	0.03
				(0.24)	(0.11)
Post*Treat				-0.14	-0.05
				(0.13)	(0.09)

Note: Investor-months are identified in which payments of newly initiated dividends exceed 1% of portfolio value (Treat == TRUE). For such investor-months, dividends, net investments, etc. are cumulated over the six-month period prior to payment (Post == FALSE) and the six-month period following payment (Post == TRUE). Each pair of observations is matched with a pair of observations covering the same time period from a control group of investors that are not paid large newly initiated dividends (Treat == FALSE). The table shows the results of regressions of cumulated net investments, purchases, etc. on cumulated dividends and dummy variables according to the classification as Post and Treat. Dividends eligible for automatic reinvestment plans are excluded. Net investments, purchases, sales, and dividends are in percentage points. Standard errors are clustered by investor and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. N = 1,036.

Table C5: German brokerage data: Methodology check - matching

	Inv	Prch	Sls	Num Prch	Num Sls
Intercept	1.32***	2.58***	1.26***	2.09***	0.12***
	(0.15)	(0.13)	(0.10)	(0.15)	(0.01)
Divs AR	0.69***	0.56***	-0.13*		
	(0.10)	(0.09)	(0.07)		
Post				-0.03	0.03
				(0.07)	(0.02)
Treat				0.06	0.01
				(0.26)	(0.02)
Post*Treat				0.78***	-0.05*
				(0.10)	(0.03)

Note: Investor-months are identified in which payments of automatically reinvested dividends exceed 1% of portfolio value and for which no payment of an automatically reinvested dividend was made in the prior six months (Treat == TRUE). For such investor-months, dividends, net investments, etc. are cumulated over the six-month period prior to payment (Post == FALSE) and the six-month period following payment (Post == TRUE). Each pair of observations is matched with a pair of observations covering the same time period from a control group of investors that are not paid large automatically reinvested dividends (Treat == FALSE). The matching is based on the Mahalanobis (1936) distance in terms of automatically reinvested dividends, net investments, purchases, sales, number of purchases, number of sales, performance, and mutual fund share in the six-month pre-payment time frame. The table shows the results of regressions of cumulated net investments, purchases, etc. on cumulated dividends and dummy variables according to the classification as Post and Treat. Net investments, purchases, sales, and dividends are in percentage points. Standard errors are clustered by investor and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. N = 4,320.

Table C6: German brokerage data: Uses of dividends and portfolio withdrawals

	Uses				Purchases and sales		P.withd.
	CshInc_t	AccWd_t	CdInv_t	Inv_t	Prch_t	Sls_t	PfWd_t
Panel A: Averaged dividend lags							
D_t	0.89***	-0.04	0.00	0.15***	0.06	-0.09***	0.85***
	(0.06)	(0.05)	(0.01)	(0.05)	(0.04)	(0.02)	(0.05)
$\frac{1}{11}\sum_{s=1}^{11}\text{D}_{t-s}$	-0.80***	0.16	-0.01	0.65***	0.23*	-0.42***	-0.65***
	(0.29)	(0.27)	(0.07)	(0.18)	(0.13)	(0.11)	(0.18)
Panel B: Individual dividend lags							
D_t	0.88***	-0.03	0.01	0.15***	0.06*	-0.09***	0.85***
	(0.06)	(0.05)	(0.01)	(0.05)	(0.04)	(0.02)	(0.05)
D_{t-1}	-0.03	-0.02	-0.01	0.06*	0.02	-0.05*	-0.06*
	(0.05)	(0.04)	(0.01)	(0.04)	(0.03)	(0.02)	(0.04)
D_{t-2}	-0.09	0.07	0.00	0.02	-0.02	-0.04*	-0.02
	(0.06)	(0.05)	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)
D_{t-3}	-0.12	0.00	0.01	0.10	0.05	-0.06***	-0.10
	(0.08)	(0.05)	(0.01)	(0.07)	(0.07)	(0.02)	(0.07)
D_{t-4}	-0.14**	0.03	0.00	0.12***	0.06*	-0.06***	-0.12***
	(0.05)	(0.04)	(0.01)	(0.04)	(0.03)	(0.02)	(0.04)
D_{t-5}	-0.09	0.00	0.00	0.09*	0.07	-0.02	-0.09*
	(0.06)	(0.04)	(0.01)	(0.05)	(0.05)	(0.02)	(0.05)
D_{t-6}	-0.12**	0.04	-0.01	0.09*	0.05	-0.03	-0.09*
	(0.05)	(0.04)	(0.01)	(0.05)	(0.04)	(0.02)	(0.05)
D_{t-7}	-0.04	-0.02	0.01	0.04	-0.01	-0.06**	-0.04
	(0.07)	(0.09)	(0.02)	(0.05)	(0.05)	(0.02)	(0.05)
D_{t-8}	-0.06	0.06	-0.01	0.01	-0.03	-0.04	-0.01
	(0.05)	(0.05)	(0.01)	(0.03)	(0.02)	(0.03)	(0.03)
D_{t-9}	-0.06	0.01	0.00	0.05	0.01	-0.04***	-0.05
	(0.04)	(0.04)	(0.01)	(0.03)	(0.03)	(0.01)	(0.03)
D_{t-10}	-0.05	0.01	0.00	0.04	0.02	-0.02	-0.04
	(0.07)	(0.06)	(0.01)	(0.03)	(0.03)	(0.02)	(0.03)
D_{t-11}	0.00	-0.03	-0.01	0.04	0.02	-0.03	-0.04
	(0.04)	(0.04)	(0.01)	(0.03)	(0.03)	(0.02)	(0.03)

Note: One column in one panel corresponds to one regression. The different dividend uses that are available to an investor are regressed on dividends paid to the investor in the current month and the eleven preceding months. In Panel A (B), dividend lags enter the regressions as an average (individually). The different regressands are: Net brokerage cash increases (CshInc), net brokerage account withdrawals (AccWd), net CD investments (CdInv), net securities investments (Inv), securities purchases (Prch), securities sales (Sls), and net portfolio withdrawals (PfWd). Controls include cash flows from other investment income, capital gains over the preceding twelve months, beginning-of-month portfolio value, investor characteristics, and time fixed effects. The reported coefficients are for dividends that are not eligible for automatic reinvestment plans. All cash flows are scaled by beginning-of-month portfolio value. Standard errors are clustered by investor and time period and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. N = 200,668.

D Online survey

Table D1: Online survey: Questions

Question	Possible answers
Q1: Have you ever received a dividend payment from a stock, mutual fund or ETF?	a) Yes b) No
Q2: What did you do with the dividend payment in the first week after payment? (In case you have received multiple dividend payments in the past, what did you mostly do?)	a) Invest in stocks, funds, etc. b) Spend c) Nothing (let it sit in the bank)
Q3: What did you do with the dividend payment over the long run, i.e. until today? (In case you have received multiple dividend payments in the past, what did you mostly do?)	a) Invest in stocks, funds, etc. b) Spend c) Nothing (let it sit in the bank)
Q4: We are interested in the structure of the brokerage account that you primarily use to invest in stocks, funds, etc. Specifically, we are interested whether this brokerage account has its own cash balance (see the example image). By that, we mean a cash position from which e.g. stock purchases are paid but which is not used for other regular payment transactions (e.g. salary, bills...). Which description matches your account better? (In case you have more than one brokerage account, think of the one with the most assets.)	a) My brokerage account has its own cash balance (like in the image). b) My brokerage account does not have its own cash balance. When I buy stocks/funds, proceeds are taken directly from my checking account (or another bank account).
Q5: Say, you receive a large dividend payment and you want to spend it on a new TV. Which description would match your spending process more accurately?	a) I would pay the TV directly from my brokerage account. b) From my brokerage account, I would first make a transfer to another bank account. Then I would pay the TV from that account.
Q6: Do you have your brokerage account (for investments) and your primary bank account (for receiving salary, paying bills...) at the same bank?	a) Same bank b) Different banks
Q7: How do you primarily buy/sell stocks and funds?	a) Online - smartphone/tablet b) Online - computer c) Phone call d) In-person meetings with a bank employee/other person

Note: This table shows survey questions and possible answers. Q2 and Q3 were only asked if Q1 was answered with "Yes". The image in Q4 is Figure B1. In Q5, "brokerage account" was replaced with "bank account that the dividend was paid out to" if Q4 was answered with b). Prior to Q4, respondents were asked if they ever had a brokerage account. Those 15 respondents who answered that they never had a brokerage account were asked to describe how they made stock market investments without a brokerage account. They were also asked to describe their payment process of a hypothetical TV purchase using a dividend. We manually translate responses to Q4, Q5, and Q6 if respondents simply misunderstood the term "brokerage account". If respondents actually never had a brokerage account, we exclude them. The German translations of "brokerage account" and "brokerage cash balance" were "Wertpapierdepot" and "Verrechnungskonto". One answer per question was allowed.

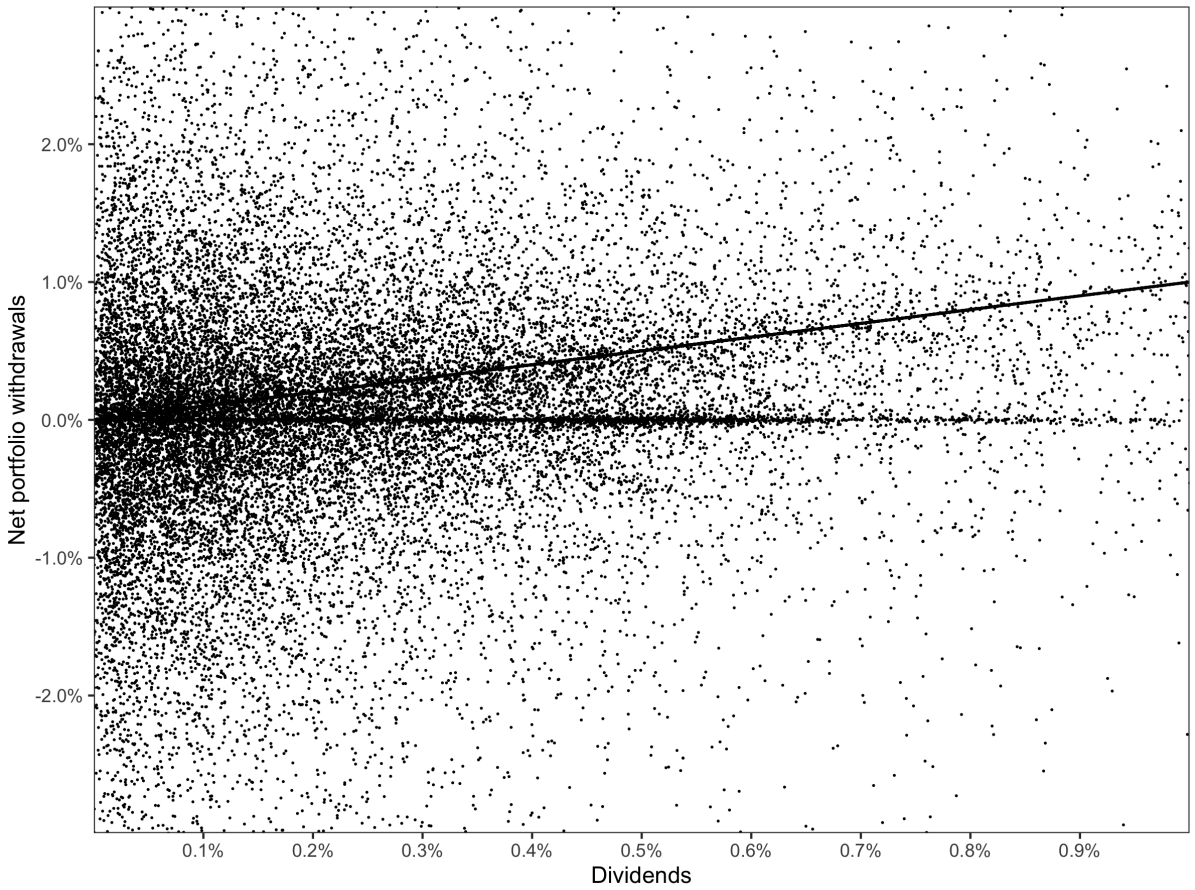
Table D2: Online survey: Results

	Means		Difference in means
	Brokerage cash	No brokerage cash	p-value
Panel A: Demographics			
US resident (= 1; Germany = 0)	51.9	43.5	0.20
Male	81.6	62.4	0.00***
Age (in years)	35.3	36.5	0.69
Full-time employed	60.9	48.5	0.11
Student	27.1	25.7	0.88
Panel B: Dividend uses			
Ever received a dividend	91.8	84.7	0.09*
In the week after payment, dividend recipients...			
...invested the dividend.	60.7	44.4	0.03**
...spent the dividend.	1.6	8.3	0.01**
...let the dividend sit in the bank.	37.7	47.2	0.20
Over the long run, dividend recipients...			
...invested the dividend.	79.1	66.7	0.05*
...spent the dividend.	9.4	15.3	0.19
...let the dividend sit in the bank.	11.5	18.1	0.22
Panel C: Account structure			
Hypothetical TV purchase requires additional bank transfer	97.1	44.7	0.00***
Main bank account and brokerage account at different banks	83.7	51.8	0.00***
Primarily trade via...			
...smartphone/tablet.	48.6	37.6	0.09*
...computer.	49.5	55.3	0.44
...phone call.	1.9	2.4	1.00
...in-person meetings.	0.0	4.7	0.01***
N	208	85	

Note: This table shows mean values of survey responses for respondents that have brokerage accounts with (without) brokerage cash. Between October 22 and 29, 2022, 300 participants with stock market investment experience were recruited. After filtering respondents based on ever having a brokerage account and passing an attention check, 293 respondents remain. All variables are in percentage points except where noted otherwise. P-values for differences in means of binary variables are calculated on the basis of Fisher's exact test. The p-value for the difference in means of age is calculated on the basis of a t-test. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

E US brokerage data

Figure E1: US brokerage data: Portfolio withdrawals of dividends



Note: This figure shows observations of net portfolio withdrawals and dividends (including ordinary, special, and fund dividends) in individual investor-months with non-zero dividends in the US brokerage data. Both, net portfolio withdrawals and dividends are scaled by beginning-of-month portfolio value and expressed in percentage points.

Table E1: US brokerage data: Summary statistics

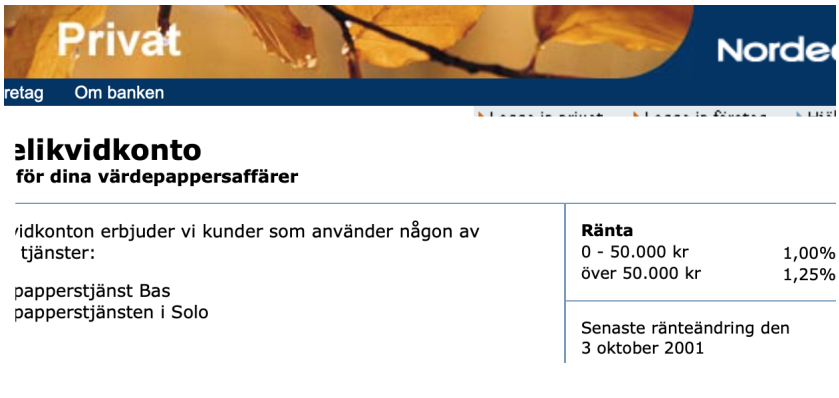
	N	Mean	P50	P10	P90	Min	Max
Portfolio composition							
A_{t-1} (in USD 1,000)	105,206	52.89	27.96	13.55	97.16	10.00	4,192.11
$A_{Stocks,t-1}/A_{t-1}$	105,206	83.12	100.00	0.00	100.00	0.00	100.00
$A_{Funds,t-1}/A_{t-1}$	105,206	16.85	0.00	0.00	100.00	0.00	100.00
$A_{Other,t-1}/A_{t-1}$	105,206	0.02	0.00	0.00	0.00	0.00	20.80
Portfolio withdrawals, dividends, and total returns							
$PfWd_t$	105,206	-0.02	0.00	-1.24	1.25	-50.00	50.00
D_t	105,206	0.19	0.00	0.00	0.54	0.00	25.17
Ret_t	105,206	1.07	1.03	-6.12	8.27	-73.96	176.47
Dividends by type							
$D_{Ord,t}$	105,206	0.11	0.00	0.00	0.38	0.00	17.88
$D_{Spl,t}$	105,206	0.00	0.00	0.00	0.00	0.00	25.12
$D_{Fnd,t}$	105,206	0.07	0.00	0.00	0.11	0.00	15.98
Dividends by type as percent of total dividends, investor-months with non-zero dividends							
$D_{Ord,t}/D_t$	47,752	74.53	100.00	0.00	100.00	0.00	100.00
$D_{Spl,t}/D_t$	47,752	0.12	0.00	0.00	0.00	0.00	100.00
$D_{Fnd,t}/D_t$	47,752	25.35	0.00	0.00	100.00	0.00	100.00

Note: All variables are on an investor-month basis, scaled by beginning-of-month portfolio value, and in percentage points except where noted otherwise.

F Simulated Swedish data

Figure F1: Brokerage cash interest rates at Nordea

Panel A: Interest rates in 2001



Panel B: Interest rates in 2004

Panel C: Interest rates in 2007

Note: This figure shows screenshots of interest rates that Nordea has paid on brokerage cash balances historically. The screenshots capture content of the following websites (as of August 25, 2023): web.archive.org/web/20011202101400fw_/http://www.nordea.se/privat/tjanster/index.html, web.archive.org/web/20050321133253/http://www.nordea.se/sitemod/default/widecarea.aspx?pid=200084, http://web.archive.org/web/20071226033327/http://www.nordea.se/Privat/Spara%2Boch%2Bplacera/Sparkonton/Räntor/789652.html. Interest rates at additional points in time can be found in the Wayback Machine's archive of Nordea's web page. If there are multiple interest rates available in a single year, we use their average for the simulation.

Table F1: Simulated Swedish data: Summary statistics

	P10	P25	P50	P75	P90	Mean
Panel A: 5th to 50th percentile of financial wealth						
Fin. wealth (actual)	15.3	26.8	50.0	93.4	163.1	76.6
Fin. wealth (obs./imp.)	19.5	33.8	57.1	97.8	164.2	81.3
Stock wealth	2.5	7.2	19.1	43.8	86.8	36.5
Brokerage cash (actual)	0.7	2.4	6.6	15.2	29.6	12.5
Brokerage cash (obs./imp.)	3.8	3.9	10.4	28.0	32.3	17.2
Other fin. wealth	2.7	6.6	15.5	33.3	63.4	27.6
Consumption (actual)	193.4	212.2	234.1	257.1	278.7	235.3
Consumption (obs./imp.)	192.0	211.4	234.0	257.8	280.2	235.3
Dividends	0.0	0.1	0.2	0.5	1.1	0.5
Panel B: 50th to 70th percentile of financial wealth						
Fin. wealth (actual)	66.1	107.2	184.3	318.9	520.2	255.8
Fin. wealth (obs./imp.)	68.6	105.2	176.9	315.2	518.2	252.7
Stock wealth	14.9	38.9	89.9	183.0	327.9	144.1
Brokerage cash (actual)	5.4	18.5	48.7	103.2	188.7	80.3
Brokerage cash (obs./imp.)	8.8	27.7	38.3	91.7	188.7	77.2
Other fin. wealth	0.8	3.6	13.2	36.6	79.7	31.3
Consumption (actual)	243.7	267.4	295.0	323.9	351.0	296.4
Consumption (obs./imp.)	240.2	266.0	295.1	325.5	354.7	296.4
Dividends	0.1	0.4	1.0	2.1	4.2	1.8
Panel C: 70th to 90th percentile of financial wealth						
Fin. wealth (actual)	79.6	147.5	291.9	584.5	1085.9	494.2
Fin. wealth (obs./imp.)	85.4	148.4	283.3	581.8	1084.7	492.4
Stock wealth	14.7	45.1	124.3	300.0	623.9	261.4
Brokerage cash (actual)	7.0	21.2	56.0	130.1	263.0	111.9
Brokerage cash (obs./imp.)	10.0	31.5	45.6	123.7	263.0	110.1
Other fin. wealth	3.9	14.8	48.5	131.2	293.9	120.9
Consumption (actual)	294.3	323.0	356.4	391.5	424.3	358.2
Consumption (obs./imp.)	291.7	322.0	356.5	392.8	427.0	358.2
Dividends	0.1	0.5	1.3	3.5	7.8	3.3
Panel D: 90th to 95th percentile of financial wealth						
Fin. wealth (actual)	159.7	291.6	567.3	1102.4	2007.5	923.8
Fin. wealth (obs./imp.)	163.0	286.0	565.2	1101.8	2007.6	922.6
Stock wealth	37.5	102.1	257.5	589.1	1178.4	502.1
Brokerage cash (actual)	12.3	37.4	99.5	227.4	456.3	193.1
Brokerage cash (obs./imp.)	16.1	45.5	85.3	227.4	456.3	191.9
Other fin. wealth	10.9	35.4	102.8	255.7	550.3	228.5
Consumption (actual)	376.3	413.0	455.8	500.7	543.0	458.1
Consumption (obs./imp.)	374.6	412.3	456.0	501.7	544.7	458.1
Dividends	0.4	1.0	2.8	6.9	14.8	6.3

(continued on next page...)

Table F1: Simulated Swedish data: Summary statistics *(continued)*

	P10	P25	P50	P75	P90	Mean
Panel E: 95th to 100th percentile of financial wealth						
Fin. wealth (actual)	253.3	468.9	935.8	1848.6	3423.5	1562.4
Fin. wealth (obs./imp.)	258.5	464.7	936.4	1849.6	3424.6	1563.5
Stock wealth	51.1	163.1	441.6	1043.0	2125.2	896.4
Brokerage cash (actual)	13.1	42.4	118.9	284.5	579.6	243.3
Brokerage cash (obs./imp.)	18.1	56.0	109.4	284.5	579.6	244.4
Other fin. wealth	5.2	34.4	149.7	454.5	1061.6	422.7
Consumption (actual)	489.1	536.9	592.5	650.8	706.1	595.7
Consumption (obs./imp.)	488.2	536.6	592.6	651.3	706.8	595.7
Dividends	0.5	1.7	4.8	12.1	26.5	11.2

Note: This table reports summary statistics for the simulated Swedish dataset. Variables marked as actual hold the actual data. Variables marked as observed/imputed hold the data that can be used given limited observability. In each wealth group, there are 200,000 households with 7 yearly observations from 2001 until 2007 giving a total of 1,400,000 observations per wealth group. All variables are in SEK 1,000.

Table F2: Simulated Swedish data: Observability statistics

Year	Obs. cond. (SEK)	Int. rate below 50,000 (SEK)	Int. rate above 50,000 (SEK)	Min. bal. (SEK)	Min. bal. (USD)	Unobs. cash per wealth group				
						1	2	3	4	5
1999	Int > 100	1.000%	1.250%	10,000	2,255	59%	16%	14%	9%	10%
2000	Int > 100	1.000%	1.250%	10,000	2,255	59%	15%	13%	8%	8%
2001	Int > 100	1.000%	1.250%	10,000	2,255	59%	15%	13%	8%	8%
2002	Int > 100	1.000%	1.500%	10,000	2,255	59%	15%	13%	8%	8%
2003	Int > 100	0.375%	0.700%	26,667	6,012	83%	31%	28%	18%	17%
2004	Int > 100	0.000%	0.100%	150,000	33,818	94%	80%	74%	59%	53%
2005	Int > 100	0.000%	0.100%	150,000	33,818	94%	80%	74%	59%	54%
2006	Bal > 10k	0.750%	0.850%	10,000	2,255	59%	15%	13%	8%	8%
2007	Bal > 10k	2.000%	2.100%	10,000	2,255	59%	15%	13%	8%	8%

Note: This table reports statistics on the observability of brokerage cash in the simulated Swedish data. Until 2005, the condition for a bank account being observable is that the bank account pays interest of at least SEK 100. Starting 2006, the condition is that the bank account has a balance of at least SEK 10,000. Interest rate data are based on historical rates paid by one of Sweden's largest retail banks. Combining the observability conditions and the interest rate data gives a minimum balance that a bank account account has to have to be observable (which is reported in SEK and 2022 USD). The last five columns show the fraction of observations in each wealth group of the simulated data that have unobserved brokerage cash.