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Keywords: retail investors, behavioral inattention, stock-picking performance, behavioral biases, heuristics, bunching, financial mistakes

JEL Codes: C93, D83, D91, G11, G12, G40, G41, H31

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We provide evidence of investor inattention to a very simple and well-known tax-exemption opportunity in the Brazilian stock market. Attentive and inattentive investors are similar along the dimensions of portfolio size and number of trades, but inattentive investors exhibit stronger behavioral biases and worse trading performance. The results hold even among high-activity investors who trade large volumes. The results are consistent with inattention being a common cause of behavioral biases.

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1 Introduction

"There should generally be greater resort to intuitive, heuristic thinking when an investor's attentional resources are depleted."

–Hirshleifer (2015)

Does inattention exacerbate behavioral biases? As the above quote suggests, inattention is likely to result in greater reliance on heuristic thinking.[1] To the extent that behavioral biases are at least partly driven by individuals reliance on heuristics, inattentive individuals should exhibit increased biases. Consistent with this insight, Gabaix (2014, 2019) provides a unifying framework for thinking about inattention as a common source of several behavioral biases by modeling inattentive individuals as placing relatively less weight on a traditional rational model and relatively more weight on a crude default model that can reflect heuristic ways of thinking. In this paper, we shed light on the relation between inattention and biases by first identifying a costly mistake made by retail investors that plausibly reflects inattention. Using this to provide cross-sectional identification of investor-level inattention, we then show that inattention is associated with greater trading biases and worse investment performance.

A growing body of research focuses on understanding implications of limited attention for financial assets, typically by using proxies for attention that are aggregated for the whole market or certain subsets of investors (e.g., aggregating retail or institutional investors).[2] However, the empirical literature is silent on the relation between attention and biases, likely because limited data availability complicates efforts to measure investor-level attention. The few existing investor-level studies of attention use online retail brokerage account

[1] According to Gennaioli and Shleifer (2010), "Heuristics describe how people evaluate hypotheses quickly, based on what first comes to mind."

[2] See e.g., DellaVigna and Pollet (2007, 2009), Cohen and Frazzini (2008), Hirshleifer, Lim, and Teoh (2009), Cohen and Lou (2012), Giglio and Shue (2014), Lou (2014), Andrei and Hasler (2015), Hillert and Ungeheuer (2018), and Cronqvist, Ladika, and Sautner (2019) for research related to price and volume effects, Barber and Odean (2008) for research related to retail order imbalance, and Da, Engelberg, and Gao (2011) and Ben-Rephael, Da, and Israelsen (2017) for research identifying measures of stock-level retail and institutional investor attention, respectively.

login data to proxy for investor-level attention, showing that attention is greater following times of higher market returns and market uncertainty, is correlated with demographic characteristics, and is positively associated with performance (Karlsson, Loewenstein, and Seppi, 2009; Sicherman, Loewenstein, Seppi, and Utkus, 2016; and Gargano and Rossi, 2018). We use investor-level data covering all transactions on the Brazilian stock exchange between January 2012 and December 2015 to identify inattention to a unique and salient tax-exemption opportunity available for individual investors in Brazil.

Our identification methodology is related to a growing literature in economics that exploits bunching induced by policy notches for identification (e.g., discontinuities in average interest rates or tax rates; see, e.g., Kleven and Waseem, 2013). Notches refer to discontinuities in the level of choice sets, where a small alteration in behavior can lead to a large difference in the outcome; therefore, absent frictions, rational individuals will adjust behavior accordingly.[3] Notches feature prominently in many policies, and many recent studies identify empirical settings in which notches incentivize bunching on one side of a cutoff and create strictly dominated choices on the other side of a cutoff, resulting in a region that should be empty in a frictionless world.[4]

Our setting uses a discontinuity in the Brazilian capital gains tax rate to identify investors who fail to adjust behavior. According to a Brazilian federal law, individual investors are exempt from income taxes on capital gains if they sell up to $20,000 (twenty thousand Brazilian reais) in stocks in a calendar month—considering the average exchange rate during our sample period, 2.77 Brazilian reais per US dollars, this threshold amounts to US$7,220. However, an investor selling $20,000.01 or more incurs a flat income tax rate of 15% over the *entire* capital gain. The $20,000 threshold has been in place since 1995 and information about

[3]There is also a literature examining bunching at discontinuities in the slope of choice sets (kinks). An important distinction between the kink and notch design is that the latter often creates a strictly dominated region.

[4]Examples of settings used in the notch literature include retirement notches (Manoli and Weber, 2016), interest rates (DeFusco and Paciorek, 2017; Best, Cloyne, Ilzetzki, and Kleven, 2018; Cespedes, 2018), and taxes (Sallee and Slemrod, 2012; Ramnath, 2013; Kopczuk and Munroe, 2015; Best and Kleven, 2017). Papers using bunching due to kinks include Saez (2010) and Chetty, Friedman, Olsen, and Pistaferri (2011).

it is everywhere. The structure of the law incentivizes total sales within a calendar month to bunch just below $20,000, leading to avoidable mistakes that result in excessive capital gains taxes payable for investors inattentive to the law. We observe large sharp bunching just below the $20,000 notch; however, we also find that a sizable fraction of investors are unresponsive to the tax notch.

As an example of our identification methodology, an investor with capital gains of $1,000 needing to sell $20,100 in stock can choose to sell all stock at once and incur a capital gains tax of $150, netting $19,950, or can instead choose to break up the trade across the current month and the next month, e.g., by selling $20,000 now and the remaining $100 on the first trading day of the next month. By delaying a small fraction of the sale until the beginning of the next month, the second strategy would incur no taxes. Our most restricted sample identifies investors paying greater than 100% marginal taxes on the sale proceeds in excess of $20,000 (as in the example above of a trader who sells $20,100 and nets $19,950). This behavior reflects a clear mistake that seems inconsistent with other frictions. For example, transactions costs are minimal in our setting.[5] No complex calculations are necessary to understand that one should sell below $20,000 rather than above, when possible; all that is required is a level of attention sufficient enough so that the individual recalls the existence of the $20,000 tax threshold at the moment of the sale (trading platforms offered by brokerage houses do not provide any type of assistance in this regard).

In our empirical analysis, we compare investors who sell just above $20,000 and incur avoidable capital gains taxes to investors with similar trading experience, similar past performance, and similar sophistication (as measured by past experience with short selling and trading options), who also have capital gains, but choose to sell an amount just below $20,000 and therefore completely avoid paying taxes on the capital gains. We document three main results.

[5]As an example of transactions costs for retail traders, consider the amount charged by the largest retail Brokerage firm in Brazil. The cost for a $20,000 volume trade in one stock would be a fixed cost of $15 plus $4 in exchange fees and $1 in city sales tax for a total cost of $20.

First, we identify avoidable, costly mistakes made by investors. We find large bunching below the $20,000 notch, indicating that many investors are aware of the policy and actively manipulate sales to avoid the tax. Figure 1 shows a large mass of sales just below $20,000 and a discontinuous drop in sales at amounts just above $20,000. To the extent that some targeting of the cutoff is imprecise, bunching will exhibit a diffuse mass, consistent with the monotonic increase in the number of investors inhabiting the four bins immediately below the cutoff. However, we also find that a sizable fraction of investors exhibit mistakes. In our main classification, inattentive investors pay an average tax of nearly $650, and the average ratio of incurred tax to marginal sale proceeds in excess of $20,000 is 3.01.

[Figure 1 about here]

Next, we examine implications of inattention for biases. In the presence of inattention, the specific heuristic that most influences behavior will depend on the task at hand, as proposed by Gabaix (2018). For instance, when assessing return distributions, inattentive investors will exhibit less attention to the true return distribution and will rely more on alternative heuristics governing assessments of return distributions, such as prospect theory. As a result, trading biases related to prospect theory will be more prevalent for inattentive investors. We specifically focus on five well-known trading biases that likely reflect common heuristics: the disposition effect, underdiversification, preference for lottery-like stocks, likelihood of purchasing salient stocks, and extrapolation. Using cross-individual regressions that include investor-level controls, we find that inattention is positively related to a composite measure of biases that is based on an equal-weighting of the quintile rankings of the investor for each of the individual biases. We also find significant results when examining the individual biases separately.

Finally, we examine implications of inattention for investor returns. After controlling for investor-level covariates, we find that inattentive investors experience statistically significantly lower returns in the period subsequent to purchase. The results are robust to

measuring trade-level performance at different horizons between 60 and 240 days and are robust to using various weighting methodologies. We also find that purchases of inattentive investors have lower Sharpe ratios, and exhibit greater volatility, despite receiving lower returns.

Our main identification methodology considers potentially rational motives for incurring taxes, such as impatience and risk aversion, when classifying investors as inattentive. Our conclusions are robust to a number of alternative methodologies of classifying attentive and inattentive investors and also to restricting the sample to only the most active traders. To mitigate concerns of reverse causality from performance or biases to inattention, we measure inattention over the first two years of the sample and examine its relation with out-of-sample performance and biases measured over the final two years of the sample. However, the results are also robust to in-sample measurement. We also fail to uncover any statistically significant effects when defining attentive and inattentive investors using placebo tax threshold values.

Our findings are related to research in three main areas. First, we contribute to the literature that examines implications of attention in financial markets. The finance literature has primarily focused on implications of aggregate attention for stock prices and volume (see e.g., DellaVigna and Pollet, 2007; 2009; Cohen and Frazzini, 2008; Hirshleifer, Lim, and Teoh, 2009; Menzly and Ozbas, 2010; Cohen and Lou, 2012; Giglio and Shue, 2014; Lou, 2014; Andrei and Hasler, 2015; and Hillert and Ungeheuer, 2018). A related strand of this literature examines implications of aggregate retail attention (Barber and Odean, 2008; Da, Engelberg, and Gao, 2011; and Peress and Schmidt, 2019) and institutional attention (Ben-Rephael, Da, and Israelsen, 2017). Due to the inherent difficulty in measuring attention at the investor level, few papers empirically examine investor-level attention. Karlsson, Loewenstein, and Seppi (2009) use retirement account login data from the Swedish Premium Pension Authority and from Vanguard and show that attention (as measured by login time) is positively correlated with past stock market returns. Sicherman, Loewenstein, Seppi, and Utkus (2016) use retirement account login data from Vanguard to show that attention is neg-

atively correlated with market declines and with the level of VIX, and that attention varies with portfolio wealth and demographic characteristics. Using data that includes time-stamps of online brokerage account logins along with information on pages visited and time spent on pages, Gargano and Rossi (2018) find that wealthier traders, more frequent traders, males, and older traders are more attentive, and that traders pay more attention to stocks that are local, and that have higher portfolio weights, and higher market cap, R&D expenditure, market-to-book, and leverage. They also find that performance is positively related to attention at the trade and portfolio level. We introduce a new measure of attention and provide the first evidence of a relation between attention and trading biases. We also provide cross-sectional evidence on performance and attention that is consistent with the conclusions in Gargano and Rossi (2018). A potential advantage of our attention proxy relative to existing proxies is that it reflects the outcome of both temporal and cognitive effort.[6]

Second, we contribute to our knowledge of retail-trader level determinants of investor biases. Examining a large set of biases, Cronqvist and Siegel (2014) find that genetic differences can explain a large amount of variation in trading biases. IQ has been found to be related to the disposition effect (Grinblatt, Keloharju, and Linnainmaa, 2012) and underdiversification (Grinblatt, Keloharju, and Linnainmaa, 2012; Korniotis and Kumar, 2013). Wealth has been linked to the disposition effect (Dhar and Zhu, 2006) and underdiversification (Calvet, Campbell, and Sodini, 2007). The disposition effect has also been found to be linked to trading experience (Seru, Shumway, and Stoffman, 2010) and leverage (Heimer and Imas, 2019). Kumar (2009) finds that gambling propensity is related to preference for lottery-like stocks.

Finally, we contribute to the literature identifying household financial decision-making mistakes (see, e.g., Campbell, 2006). The literature has documented mistakes in household financial decision-making related to retirement choices (Choi, Laibson, and Madrian, 2011),

[6]For example, two investors equally intense in their engagement would exhibit different levels of attention if one is engaged for longer than the other. Alternatively, two investors engaged for the same amount of time would exhibit different levels of attention if one is distracted or drowsy.

mortgage borrowing (Agarwal, Green, Rosenblatt, and Yao, 2015; Keys, Pope, and Pope, 2016; Agarwal, Ben-David, and Yao, 2017), non-mortgage borrowing (Agarwal, Skiba, and Tobacman, 2009; Stango and Zinman, 2009; Bertrand and Morse, 2011; Cespedes, 2018; Jorring, 2018; Weber, 2019), and insurance mistakes (Bhargava, Loewenstein, and Sydnor, 2017). Some of this literature has focused on tax-related mistakes (Feldman, Katuscak, and Kawano, 2016; Bradley, 2017). See Campbell (2006, 2016) for expanded discussion of the literature related to financial mistakes. Within this literature, we are most closely related to the studies taking the additional step of relating mistakes to cross-sectional individual-level differences in behavior (e.g., Cespedes, 2018; Jorring, 2018; Weber, 2019).

The paper proceeds as follows. Section 2 discusses the tax law, identification of attentive and inattentive investors, and provides evidence of costly investor mistakes. Section 3 introduces the trading biases we examine. Section 4 presents the main results for the relation between attention and biases and performance. Section 5 presents robustness tests, and Section 6 concludes.

2 Identifying inattentive investors

Our data come from the "Comissão de Valores Mobiliários" (CVM), the Brazilian equivalent to the Securities and Exchange Commission (SEC) in the US, and contains the trading activity of all individual investors in the Brazilian stock market from January 2012 to December 2015.[7] We observe the quantity of shares each investor buys and sells and the respective financial volumes at the investor-stock-day level. The data contain a unique identifier that allows us to follow each investor over time. The full dataset contains 47,267,584 individual-stock-day observations, which are the result of the trading activity of 827,573 individual investors on 423 different stocks. In monetary terms, the total volume purchased by individuals correspond to US$170.04 billion over the four-year period (excluding day-trades).

[7] This is the same dataset used by Chague, De-Losso, and Giovannetti (2018) to analyze whether stock price falls cause individuals to buy stocks. Since our data come from the regulator of the Brazilian financial market, they are extremely reliable.

Figure 2 reports the market return during our full sample period (2012-2015).

[Figure 2 about here]

2.1 The tax-exemption law

A simple and long-established tax-exemption opportunity is available to all Brazilian individual investors at the moment they are selling their stocks. According to Brazilian Federal Law N° 9.250 from 1995, individual investors are exempt from income taxes on capital gains if they sell up to $20,000 (twenty thousands Brazilian reais) in stock in a calendar month—considering the average exchange rate during our sample period, 2.77 Brazilian reais per US dollars, this threshold amounts to US$7,220.[8] However, an investor selling $20,000.01 or more incurs a flat income tax rate of 15% over the *entire* capital gain. The $20,000-threshold has been in place since 1995 and information about it is everywhere. For example, information is available on brokerage house websites (however, websites do not offer a separate reminder at the time of the sale), and when searching on Google "imposto de renda sobre ganhos em bolsa" (income taxes over gains in the stock market), the first entry that shows up is precisely an excerpt of the tax exemption rule clearly stating the $20,000 threshold (see Figure 3).

[Figure 3 about here]

The law was established in 1995 in conjunction with the end of Brazilian hyperinflation. It was one of many laws enacted during the period after the economy was stabilized in 1994. The straightforward $20,000 threshold was probably created to simplify the process of filing taxes. The text of the law explicitly states that "sales of small amounts" are exempt, and then states the $20,000 threshold.

[8] The capital gains tax law applies to direct trading of stocks. It does not apply to capital gains on other sales, such as mutual funds or options.

For illustrative purposes, Table 1 provides ten examples of investors exhibiting clear financial mistakes by incurring avoidable capital gains taxes. The examples in Table 1 focus on investors selling only one position in a month, who sell at a value just above $20,000, and who do not sell any stock in the following month. Nine out of the ten investors pays a tax that exceeds the incremental sale value in excess of $20,000, resulting in a marginal tax rate in excess of 100%. That is, these investors would have earned higher net proceeds by selling fewer shares for a value just below $20,000, than by selling more shares and receiving gross proceeds in excess of $20,000 from the sale. For instance, the fifth investor in Table 1 sells $20,025 on November 29, 2012, incurring a capital gains tax totaling $1,227.90 based on the investor's purchase price, leaving net proceeds of only $18,797.10. To make matters worse, the investors included in Table 1 sold shares near the end of the calendar month, and in some cases, needed to wait only one day to sell the remaining shares without incurring a tax.

[Table 1 about here]

Figure 1 shows the histogram of the total selling volume for each individual-month pair in which the investor had some positive capital gain. The histogram illustrates that many investors take advantage of the $20,000 tax-exemption threshold: there is a disproportionate increase in the number of observations *just below* $20,000.

2.2 Identifying sub-optimal decisions

We next discuss our methodology to identify attentive and inattentive investors. The tax-exemption law provides the econometrician an opportunity to identify clear *ex-ante* sub-optimal decisions by individual investors. Specifically, we can identify individuals who, when selling their stocks, were not sufficiently attentive to take advantage of the tax-exemption rule. Figure 1 suggests that one plausible way of classifying investors is to categorize investors selling in the bin just below the $20,000 cutoff ($19,500 - $20,000) as attentive and

investors in the bin just above the cutoff ($20,000.01 - $20,500) as inattentive. While we use this classification strategy as a robustness test, our main strategy attempts to account for additional factors influencing investor sale amount around the $20,000 cutoff. In particular, we conservatively account for the influences of investor impatience to receive funds and investor concern of a subsequent price drop.

Our main classification methodology follows. Suppose we observe an investor who sells a volume equal to V in month t, such that $\$20,000 < V \leq \$40,000$, and who has capital gains equal to $\$\pi$. Because V exceeds the $\$20,000$ threshold, the investor has to pay $\tau = 0.15 \times \pi$ in taxes at the end of month $t+1$.[9] We conservatively assume that the investor is impatient and needs V in cash at that moment. In this case, simply selling $20,000 in month t and waiting until month $t+1$ to sell the remaining stocks is not an option. However, a straightforward alternative is the following. An investor can sell $\$20,000$ worth of stocks in month t and, at the same time, borrow the remaining $V - \$20,000$ from his bank (in a very simple and automatic way as we explain below). In month $t+1$, the investor repays the bank loan, paying $(V - \$20,000) \times i$ in interest, and sells the remaining shares. To address investor concern that the stock price might drop before selling the remaining shares at the beginning of the upcoming month, we let ξ denote a very pessimistic expectation for a one-month stock price drop; the investor then expects to lose in a worst-case scenario $(V - \$20,000) \times \xi$ by waiting to sell the remaining stocks until month $t+1$. Accordingly, this alternative way of financing liquidity needs allows the investor to use V in cash in month t with a cost of $(V - \$20,000) \times (i + \xi)$. Based on this logic, we say the decision to sell $\$20,000 < V \leq \$40,000$ instead of $\$20,000$ was sub-optimal if

$$\tau > (V - \$20,000) \times (i + \xi) + \$50 \tag{1}$$

where we include $50 on the right-hand side to rule out cases where taxes are too small to motivate the investor to forego the convenience of one stock sale instead of breaking the sale

[9] Taxes over capital gains have to be paid by the end of the month following the sale.

up over two separate months.[10]

We choose fairly conservative values for i and ξ. With respect to i, we consider the overdraft fees charged by a typical Brazilian bank of 10% per month.[11] This is a very expensive type of loan but is widely available and very convenient; the funds are automatically approved with no further paperwork required.[12] With respect to investor pessimism about the near future, we set ξ equal to 10% (as a reference, the tenth percentile of all monthly returns in our sample during 2012-2013 is -11.5%).

Our dataset allows us to directly obtain V for all investors in Brazil during the sample period. We estimate the capital gains of each sale as follows. For each stock, we compute the daily net change in the investor's holdings —the number of shares bought minus the number of shares sold —and cumulate these net changes over time.[13] Whenever there is a net purchase, we also update the purchase price of the entire position by computing the weighted average of the purchase prices. Then, for every day that there is a net sale, we compute the capital gain by multiplying the net number of shares sold times the price gain —the price of the sale minus the average purchase price of the position. If there is no purchase prior to the sale, we compute the price gain using the price 120 days prior to the sale as the purchase price. In unreported analyses, we confirm that our results hold if we exclude instances when there is a sale of a stock that was purchased before our data starts (prior to January 2012).

In robustness tests, we use three alternative methods to classify selling decisions as sub-optimal. First, if the volume sold in the month was "slightly above" $\$20,000$ (and $\tau >$

[10] In unreported analysis we account for the possibility that traders attempt to sell below $20,000, but mistakenly sell above $20,000 due to the trade being executed at a price different from what the trader observes. To do so, we calculate average bid-ask spreads at the stock-day level and find that the results are robust to excluding instances where the bid-ask spread could have plausibly caused an investor attempting to sell below $20,000 to have sold at a value greater than $20,000.

[11] Information about overdraft fees charged by Brazilian banks is available at https://www.bcb.gov.br/pt-br/#!/c/TXJUROS/

[12] In Brazil this type of loan is called "cheque especial." The amount a stock-market investor with liquidity needs would have to borrow is consistent with typical overdraft limits.

[13] The cumulative sum of the daily net changes can become negative eventually. Instead of assuming that the investor is selling short, we assume he had shares in his portfolio from a purchase made prior to our sample and replace negative cumulative sums with zero.

\$50), we directly say that the selling decision was sub-optimal; the investor could have avoided paying taxes by selling fewer stocks. We consider as "slightly above", a volume from $\$20,000.01$ to $\$20,500.00$. The second and third alternative methods are more restrictive versions of the benchmark method (i.e., fewer selling decisions are classified as sub-optimal under both methods than under the benchmark method). The second alternative method requires $\tau > V - \$20,000 + \$50$ to classify the decision as sub-optimal; in this case the tax paid is greater than the sale value in excess of $\$20,000$, resulting in a marginal tax rate greater than 100%. The third alternative method uses the benchmark method from equation 1, but only considers monthly sales in which all sales occurred in the last week of the month. This identifies investors who only have to wait a very short time period to sell the remaining shares.

2.3 Descriptive statistics: 2012-2013

Our empirical analysis proceeds in two steps. First, we use the 2012-2013 period to classify individuals as attentive and inattentive. Next, we evaluate out-of-sample differences in trading behavior using the 2014-2015 period.

We classify an investor as inattentive if he made at least one sub-optimal decision (in the sense of equation 1) during 2012-2013 and never made an optimal decision, i.e., sold a volume "slightly below" the \$20,000 threshold while having capital gains. We consider as "slightly below" the \$500 interval from \$19,500.01 to \$20,000.00 (including \$20,000.00). We categorize attentive investors as those who in at least one month sell a volume slightly below the \$20,000 threshold (and present no sub-optimal decision in any other month).

Our main classification identifies 4,688 inattentive investors and 7,242 attentive investors. Importantly, we find that attentive and inattentive investors are similarly active, as measured by trading volume and number of purchases. This helps alleviate the concern that infrequent traders might exhibit lower attention to the tax-exemption law and, at the same time, might be more prone to display strong behavioral biases and to present worse trading performance.

Nevertheless, we also present results separately for a sub-sample of "high-activity" investors, defined as investors with at least one stock purchase or sale in at least half the months in 2012-2013. The high-activity sample yields 2,662 inattentive investors and 4,283 attentive investors.

Table 2 presents some descriptive statistics of the trading behavior of the two investors groups in 2012-2013. The groups are very similar. Considering all investors (Panel A), the median attentive investor is 48 years old at the beginning of the sample, purchased a total of US$82,354 in stocks during 2012-2013, made a total of 21 purchases, and had an average volume per purchase of US$4,292; in turn, the median inattentive investor is 46 years old, purchased a total of US$83,904 and made a total of 24 purchases with average volume of US$3,731. With respect to in-sample stock-picking performance, attentive investors perform better than inattentive investors, although both present negative performance. The median attentive investor had an average 120-day future return of -2.1% (-4.5% risk-adjusted, using a 4-factor model), while the the median inattentive investor had an average 120-day future return of -3.9% (-5.6% risk-adjusted).[14] Considering only high-activity investors (Panel B), the median attentive investor is 49 years old, purchased a total of US$134,760 and made a total of 36 purchases with average volume of US$3,961; in turn, the median inattentive investor is 47 years old, purchased a total of US$146,467 and made a total of 42 purchases with an average volume of US$3,433. The median attentive investor had an average 120-day future return of -2.2% (-4.7% risk-adjusted), while the median inattentive investor had an average 120-day future return of -4.2% (-5.8% risk-adjusted).

[Table 2 about here]

Appendix Table A1 examines whether investors classified as inattentive in the first half of the sample are more likely to be inattentive to the tax law in the second half of the sample, relative to investors classified as attentive in the first half of the sample. The table presents results from regressions of a variable taking a value of one if an investor is classified as

[14] Risk-factors for the Brazilian market are publicly available at www.nefin.com.br.

inattentive using data from the second half of the sample on a variable taking a value of one if an investor is classified as inattentive in the first half of the sample. A number of investor-level control variables measured over the first half of the sample are included. Restricting the analysis to investors classified as attentive or inattentive in the first half of the sample, we find that an investor is more likely to be classified as inattentive in the 2014-2015 sample period if he is classified as inattentive in the 2012-2013 sample period. Inattention, as measured by failing to avoid costly capital gains taxes, is a persistent investor characteristic.

2.4 Costly investor mistakes

Table 3 provides an estimate of the magnitude of the financial cost of inattention for the four different investor classifications. Panel A presents results for the main classification and shows that inattentive investors pay average taxes of nearly \$650. The average ratio of taxes paid to value sold in excess of \$20,000 is 3.01. That is, on average inattentive investors incur taxes that are three times larger than the marginal sale proceeds in excess of \$20,000 received from the sale of stock. The remaining panels present results for the three alternative classification methodologies. Panel C shows that the average mistake is greater when classifying inattentive investors as those incurring a marginal tax rate in excess of 100%. These investors pay average taxes of \$534 on marginal sale proceeds of \$246. The median investor pays avoidable taxes that are 2.2 times larger than the incremental sale proceeds. The distribution is highly skewed and the average ratio of taxes paid to maginal sale proceeds is economically large, at 7.82. Overall, the results illustrate that some investors incur avoidable capital gains taxes that prove costly.

[Table 3 about here]

3 Measuring biases

We focus on five prominent biases shown in the existing literature to influence investor behavior: the disposition effect, under-diversification, preference for lottery-like stocks, preference for salient stocks, and extrapolation.

Disposition effect

The disposition effect refers to the tendency of investors to ride losses and realize gains. At least since Shefrin and Statman (1985), many papers have documented the disposition effect in financial markets (Odean, 1998; Grinblatt and Keloharju, 2001; Coval and Shumway, 2005; Locke and Mann, 2005; Dhar and Zhu, 2006; Barberis and Xiong, 2009; among others). Potential explanations for the disposition effect include prospect theory and realization utility. To the extent that inattentive investors place more weight on a default heuristic model, such as prospect theory, and accordingly are more likely to have their actions guided by the action that spontaneously comes to mind with little thinking, inattentive investors are likely to exhibit a greater disposition effect.

To identify the disposition effect at the investor level, we calculate the Proportion of Gains Realized (PGR) and the Proportion of Losses Realized (PLR) and compute the ratio of the two (PGR/PLR) in the spirit of Odean (1998). The ratio PGR/PLR for a given investor is the average of his monthly ratio PGR/PLR. We cannot compute this ratio for investors with no loss realized or for investors with either no losses or no gains. This restricts the sample to 5,649 out of the 11,930 investors. Larger values are associated with increased disposition effect.

Under-diversification

Odean (1999), Barber and Odean (2000, 2001), and Goetzmann and Kumar (2008) show that overconfident individuals tend to hold under-diversified portfolios. As pointed out by Gabaix (2019), an investor's overconfidence may be seen as inattention to his own ability.

For each investor, we compute $HHI-stocks$ and $HHI-industries$. $HHI-stocks$ is the average of the monthly Herfindahl-Hirschman index for each investor based on the volume invested per stock in each month during 2014 and 2015. $HHI-industries$ is the average of the monthly Herfindahl-Hirschman index for each investor based on the volume invested per industry in each month during 2014 and 2015 (the average of the monthly HHIs). Both measures vary from 0 to 1, with larger values indicating lower diversification.

Lottery-like stocks

Barberis and Huang (2008) propose that preferences for lottery-like stocks may be related to cumulative prospect theory of Tversky and Kahneman (1992). As pointed out by Gabaix (2019), the transformed probability used by investors under cumulative prospect theory may be seen as inattention to the true probability distribution.

We define a lottery-like stock following Kumar (2009); stocks with nominal prices in the bottom tercile, and idiosyncratic volatility and skewness in the top tercile are defined as lottery-like stocks. These cutoffs are computed on a monthly basis. Idiosyncratic volatility and skewness are computed exactly as in Kumar (2009). For each investor, we then calculate the fraction of lottery-like stocks among all his purchases in 2014-2015 and use this as our measure of lottery-like preferences.

Salient stocks

Because attention is a limited cognitive resource for individuals (Kahneman, 1973), individuals tend to focus on salient stocks when deciding which stocks to buy (Barber and Odean, 2008). According to Kumar, Ruenzi, and Ungeheuer (2017), stocks are most salient when they appear on newspapers and webpages as top winners and losers of the day.[15] Consistently, the authors find that buying pressure surges when stocks make those ranks.

The specialized webpages in Brazil display real-time rankings with the five best and five worst performing stocks in the Ibovespa.[16] Based on this, we say that an individual purchased a salient stock if the stock was among the five best or five worst Ibovespa stocks of the day. We measure investor-level preference for salient stocks by computing the fraction of salient stocks purchased by each investor across all his purchases during 2014-2015.

Extrapolation

Extrapolation, or performance chasing, is related to the fact that individual investors often extrapolate recent good stock or fund performance even when it shows little to no persistence (Patel, Zeckhauser, and Hendricks, 1991, and Benartzi, 2001). Underlying heuristic explanations for extrapolation include representativeness (Kahneman and Tversky, 1972, 1973) and base-rate neglect (Tversky and Kahneman, 1974). Gabaix (2019) provides an explanation related to projection bias and inattention to the true projection model.

We define a stock as high recent-past performance if its 20-day past return is above 11.1%, which is the 90th percentile of this variable in our sample period. Since extrapolation is defined using short-term past returns, it becomes less related to usual momentum-based strategies. We measure extrapolation at the investor level by calculating the fraction of stocks

[15] Wang (2017) finds that top winners and losers based on uninformed rankings attract greater attention.

[16] Ibovespa is the most widely used index of Brazilian stocks. The index is composed of firms with the largest market capitalization and high trading volume. The number of firms in the index vary every four months. During our sample period, the median number of stocks in the index is 70, with a minimum of 68 and a maximum of 73. For the methodology of the Ibovespa, see http://www.bmfbovespa.com.br/en_us/products/indices/broad-indices/bovespa-index-ibovespa.htm.

with good recent-past performance purchased by each investor among all his purchases in 2014-2015.

Bias index

To summarize the information in the different biases, we construct a bias index. To calculate the bias index, we rank investors into quintiles within each bias and then, for each investor, compute the average quintile across the biases. This provides a summary measure of the behavioral biases of each investor, with larger values reflecting stronger behavioral biases.

4 Results

4.1 Descriptive statistics: 2014-2015

In this section, we use the second part of our sample (2014-2015) to compare the out-of-sample trading behavior of attentive and inattentive investors. First, we examine behavioral biases by running cross-individual regressions separately for each bias and for the bias index. Then, we compare trading performance by running cross-individual regressions for various measures of investor performance. In all cross-individual regressions, the main explanatory variable is a dummy variable taking a value of one if the investor is classified as inattentive in the pre-sample and zero if attentive.

We include controls for past trading ability, financial sophistication, and trading experience. Specifically, we control for past trading ability by including a variable, *performance*, that is equal to the average 120-day risk-adjusted return across all purchases by the individual in 2012-2013. To account for investor sophistication, we include *short-seller*, a dummy variable equal to one if the investor sold short a stock in 2012-2013, and *option-trader*, a dummy variable that equals one if the investor traded an option in 2012-2013. We control for trading experience by including controls for the average volume across all purchases by

the individual in 2012-2013 (*volume*), and additional controls for the number of months and separately for the number of days in which the investor trades in the 2012-2013 time period (*# of months* and *# of days*, respectively). In all regressions we demean the control variables which are not dummy variables across all individuals present in the regression. By doing this, the constant term reflects the value of the dependent value for the average investor.

Table 4 presents descriptive statistics for the investor-level dependent variables used in the cross-individual regressions. Variables are computed in the out-of-sample period (2014-2015). *PGR/PLR* captures the disposition effect and is the ratio between the proportion of gains realized and the proportion of losses realized by the individual (an average across the individual's monthly ratios). $HHI-stocks$ ($HHI-industries$) captures under-diversification and is the average of the monthly Herfindahl-Hirschman index for each investor based on the volume invested per stock (industry) in each month during 2014 and 2015. *% of lottery-like stocks* captures preference for lottery-like stocks and is measured as the investor's fraction of purchases of lottery-like stocks (stocks with nominal prices in the bottom tercile, and idiosyncratic volatility and skewness in the top tercile, as in Kumar (2009)). *% of salient stocks* captures preference for salient stocks and is the investor's fraction of purchases of salient stocks (a stock is salient if it is displayed on specialized webpages rankings as one of the five best or five worst performing stocks of the day). *% of extrapolation stocks* captures extrapolation and is the investor's fraction of purchases of stocks with a very high 20-day past return (greater than 11.1%, the 90th percentile in our 2014-2015 sample). Finally, as the main performance measure we use trading performance, measured as the average h-day ahead risk-adjusted return across all purchases by the investor (h = 60, 120, and 240). As alternative performance measures we also use the median 120-day ahead risk-adjusted return across all purchases, the minimum 120-day ahead risk-adjusted return across all purchases by the investor, the standard deviation of the 120-day ahead risk-adjusted return across all purchases by the investor, and the Sharpe ratio, the ratio of the average 120-day ahead return in excess of the risk-free rate divided by the standard deviation of the 120-day ahead

return across all purchases (winsorized at 1% and 99%).

[Table 4 about here]

4.2 Inattention and biases

We begin by examining the relation between inattention and each bias, and then present results for the comprehensive bias index. Table 5 presents results for cross-individual regressions for the disposition effect. Columns 1, 2, and 3 present results for the sample that includes all investors, and columns 4, 5, and 6 present results for the high-activity subsample of investors. From the specification with all controls in column 3, the value of PGR/PLR for attentive investors is 0.978 and for inattentive investors is 0.031 higher, suggesting a modest economic effect of inattention for the disposition effect. Column 6 reports similar results when confining the analysis to only high-activity investors. The results are significant at the 5% level in four of the six columns, and retain significance at the 10% level when including the full set of controls. The evidence is consistent with a stronger disposition effect for inattentive investors.[17]

[Table 5 about here]

Table 6 presents cross-individual regression results for under-diversification. In columns 1, 2, 3, and 4 (5, 6, 7, and 8) all investors (high-activity investors) are considered. For the high-activity sample of investors, the results are significant at the 1% level in all specifications, while for the all-investors sample, the results are significant at the 10% or better level for $HHI-stocks$, but insignificant for $HHI-industries$. The results are of moderate economic

[17] Attentive investors should split their selling activity of winning positions across months in order to take advantage of the tax benefit. This naturally increases their PGR and, consequentially, produces a bias in the regression against our finding that attentive investors display lower disposition effect.

magnitude; among the high-activity sample, inattentive investors exhibit 4.2% lower stock diversification (from column 6, 0.021/0.497) and 2.7% lower industry diversification (from column 8, 0.016/0.587) relative to attentive investors. The results provide evidence consistent with inattentive investors diversifying less than attentive investors.

[Table 6 about here]

Table 7 examines the relation between inattention and lottery-like preferences. Columns 1, 2, and 3 (4, 5, and 6) report results for all (high-activity) investors. From the full-control specification in column 3, the fraction of lottery-like stocks purchased by inattentive investors is 26.5% higher (0.931%/3.509%) relative to attentive investors. Economic magnitudes for the high-activity sample are similarly large, with inattentive investors purchasing lottery-like stocks at a rate 21.8% higher than exhibited by attentive investors (0.922%/4.223%). The results are statistically significant at the 1% level in all specifications. The evidence is consistent with inattentive investors exhibiting greater propensity to evaluate distributions in accordance with prospect theory.

[Table 7 about here]

Table 8 examines results for salient stocks. For the full-sample specification with all controls in column 3, 10.826% of the purchases by attentive investors are salient stocks; in turn, the fraction of salient purchases by inattentive investors is 11.768%, an increase of 8.7% relative to attentive investors. The magnitudes are slightly higher for the high-activity full-control specification in column 6, as inattentive investors purchase salient stocks at a rate that is 12.4% higher than for attentive investors (1.300%/10.529%). The results are statistically significant at the 1% level and are consistent with the interpretation that inattentive investors exhibit a greater propensity to purchase salient stocks.

[Table 8 about here]

Table 9 shows the results for extrapolative purchases. In columns 1, 2, and 3, all investors are considered, and in columns 4, 5, and 6, only high-activity investors are considered. According to column 3, which uses all control variables, 9.215% of the purchases by attentive investors are extrapolative purchases; in turn, the fraction of extrapolative purchases by inattentive investors is 11.6% higher in relative terms (1.068%/9.215%). According to column 6, considering only high-activity investors, 8.995% of the purchases by attentive investors extrapolative purchases, while the fraction of extrapolative purchases by inattentive investors is 12.4% higher in relative terms (1.120%/8.995%). The results are significant at the 1% level and suggest that inattentive investors are more likely to purchase stocks by extrapolating recent good performance.

[Table 9 about here]

Table 10 shows results for the comprehensive bias index. The results in column 3 for the full sample show that the average inattentive investor exhibits extrapolation that is 4.7% higher than for attentive investors (0.121/2.566). The effect is statistically significant at the 1% level in all specifications and slightly economically larger for high-activity investors. Overall, the evidence suggests that inattention is associated with stronger biases.

[Table 10 about here]

4.3 Inattention and trading performance

If inattentive investors indeed display stronger behavioral biases, they should consequently present worse trading performance. We examine this hypothesis by comparing the out-of-sample trading performance of inattentive and attentive investors. For each investor we

compute the average h-day ahead risk-adjusted return across all purchases for horizons of $h = 60$, 120, and 240 days. We also report results using alternative performance metrics of median, minimum, standard-deviation, and Sharpe ratio. In all regression we measure relevant control variables at horizons equal to the horizon of the dependent variable. All other explanatory variables remain as previously defined.

Table 11 presents the cross-individual regressions where the dependent variable is the investor's average future risk-adjusted return in the period following purchase. Regressions in Panel A examine all investors and regressions in Panel B examine only high-activity investors.

[Table 11 about here]

Columns 2, 4, and 6 of Panel A, show that both attentive and inattentive investors exhibit negative average risk-adjusted returns, but that inattentive investors display statistically significantly worse performance than attentive investors at all horizons. Columns 2, 4, and 6 show that at the 60, 120, and 240-day horizons, inattentive investors earn returns that are 0.355%, 0.627%, and 1.067% lower, respectively. The results are similar, and slightly economically larger, for the high-activity sample. Appendix Table A2 confirms that the results are robust to a value-weighting methodology that weights returns by the value of the transaction.

Table 12 confirms that inattentive investors display worse performance when using alternative return measures. The first four columns show that the conclusions are robust to using the median return or the minimum return as alternative performance measures. Columns 5 and 6 show that despite lower returns, inattentive investors on average hold riskier stocks, as measured by standard deviation. The last two columns of the table show that inattentive investors exhibit substantially worse performance when examining Sharpe ratios. Panel B confirms that the results are robust to only considering the high-activity sample of investors.

[Table 12 about here]

5 Robustness

In this section we examine whether the main results are robust to alternative classifications of inattention, exclusion of investors with previously accumulated capital losses, in-sample definition of inattention, and tests using placebo tax cutoff values.

5.1 Alternative classifications of inattention

In this section we repeat the full set of main regression specifications, replacing the benchmark inattention measure with the three alternative classifications of inattention discussed in Section 2.2. We report the t-statistics of the coefficient on the inattentive dummy variable from the regression specifications with the complete set of controls.

In the first alternative classification, the sub-optimal decision is defined as a monthly selling volume between \$20,000.01 and \$20,500.00 in the presence of positive capital gains and taxes above \$50. In this case, by selling a volume slightly smaller, the investor would avoid paying taxes on capital gains. We define an investor as inattentive if we observe such a sub-optimal decision in at least one month during 2012-2013 and if we observe no month in which the investor takes advantage of the tax-exemption law by selling a volume between \$19,500.01 and \$20,000 in the presence of capital gains. Attentive investors are defined as those who, having capital gains, sell in at least one month a volume between \$19,500.01 and \$20,000 and never sell a volume between \$20,000.01 and \$20,500.00.

In the second alternative classification, the sub-optimal decision is defined as a monthly selling volume V above \$20,000 such that $\tau > (V - \$20,000 + \$50)$. This definition captures investors paying a marginal capital gains tax rate greater than 100% on the amount sold in excess of \$20,000. That is, the amount sold in excess of the threshold is not sufficient to cover the taxes incurred. As before, we define an investor as inattentive if we observe such

a sub-optimal decision in at least one month during 2012-2013 and if we observe no month in which the investor takes advantage of the tax-exemption law by selling a volume between \$19,500.01 and \$20,000 in the presence of capital gains. Attentive investors are those who, having capital gains, sell in at least one month a volume between \$19,500.01 and \$20,000 and never a volume V above \$20,000 such that $\tau > (V - \$20,000 + \$50)$.

The third alternative classification is the same as our benchmark classification, except that it restricts the sample to monthly sales in which all sales occur in the last week of the month. In this sample, we focus on the subset of inattentive investors who have to wait only a few days before being able to make a sale in the next month. As before, we classify an investor as inattentive if we observe a sub-optimal decision in at least one month during 2012-2013 and if we observe no month where he apparently takes advantage of the tax-exemption law by selling a volume between \$19,500.01 and \$20,000 in the presence of capital gains, with the first sale occurring in the last week of the month. Attentive investors are those who, having capital gains, sell in at least one month a volume between \$19,500.01 and \$20,000 (with the first sale in the last week of the month) and never a make a sub-optimal decision.

The t-statistics for the coefficients on the inattentive dummy variable for each regression are shown in Table 13. The first six rows present results for the three alternative classification methodologies for the all investors sample and the high-activity subsample. The last two rows of the table address previously accumulated capital losses that can be used to partially offset a capital gain. An investor with a previous capital loss would be better off selling at a value slightly below \$20,000 and retaining the capital loss exemption opportunity for future use, rather than unnecessarily using it to offset capital gains for a sale slightly above \$20,000. However, some investors who are attentive to the capital gains tax law might not be able to solve this simple optimization problem, and might mistakenly think it optimal to sell at values slightly above \$20,000 while using losses to partially or fully offset the gain. The last row of Table 13 shows that the results are robust to the exclusion of investors who

have previously accumulated capital losses that can be used to partially or fully offset a capital gain. Overall, the results are robust to alternative classifications of inattention and to consideration of capital losses.

[Table 13 about here]

5.2 In-sample evidence

Our main analysis focuses on out-of-sample trading behavior to mitigate concerns of reverse causality from biases or trading performance to inattention. However, we would also expect the relation between attention and biases and performance to hold when measured over the same time period used to identify inattention. Table 14 examines the in-sample relation between attention and investor behavior. Because some of the biases require information on investor positions, we continue measuring biases using the 2014-2015 sample period, but now define inattention using the 2014-2015 time period. Table 14 reports t-statistics for the coefficients on the inattentive dummy for bias and performance regressions for the benchmark and alternative classifications of inattention. The results show that the previously documented relation between inattention and biases and performance is robust to the in-sample definition of inattention.

[Table 14 about here]

5.3 Placebos

Our last robustness exercise presents a placebo test. We report t-statistics using the \$500 window to the left and right of five placebo cutoffs: \$10,000, \$40,000, \$60,000, \$80,000, and \$100,000. We use the \$500 window instead of equation (1) so as to exclude investors who sold

just below the true cutoff of $20,000 from being classified as inattentive under the $10,000 cutoff.

Taking the $10,000 cutoff as an example, we define $V > \$10,000$ as "sub-optimal" if an amount between $10,000.01 and $10,500 is sold. We then classify an investor as "inattentive" if we observe a "sub-optimal" decision in at least one month during 2012-2013 and if we observe no month where, having capital gains, the investor sells a volume between $9,500.01 and $10,000. In turn, the "attentive" investors are those who in at least one month sell an amount between $9,500.01 and $10,000 and present no "sub-optimal" decision in any month.

Table 15 presents the placebo results. To facilitate comparison, in the second row of both panels of the table we report the t-statistics using the true $20,000 cutoff (these are the same t-statistics presented in the first two rows of Table 13). There are no instances in which the placebo tests are of the predicted sign and attain statistical significance at the 10% level or better.

[Table 15 about here]

6 Conclusion

We exploit a unique tax law in Brazil to identify investor-level differences in attention to a tax-exemption opportunity. We first document that a sizable portion of investors exhibit mistakes by selling stocks in amounts slightly larger than $20,000 and incurring avoidable capital gains taxes. Absent other frictions, these investor mistakes plausibly reflect inattention to the tax law. On the other hand, a much larger fraction of investors bunch just below $20,000, exhibiting active avoidance of capital gains taxes.

Relative to investors attentive to the tax law, inattentive investors exhibit increased biases. In particular, we focus on the biases of the disposition effect, under-diversification, preference for lottery-like stocks, likelihood of purchasing salient stocks, and extrapolation.

We also find evidence that inattention is negatively related to trading performance in the cross-section of investors. Overall, the evidence contributes to our understanding of retail trader behavior and to the literature examining attention in financial markets. More specifically, the results contribute to a growing literature focusing on investor-level implications of attention. As a whole, the evidence is consistent with inattentive investors exhibiting increased reliance on heuristic thinking and decreased reliance on fundamentals.

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Figures and Tables

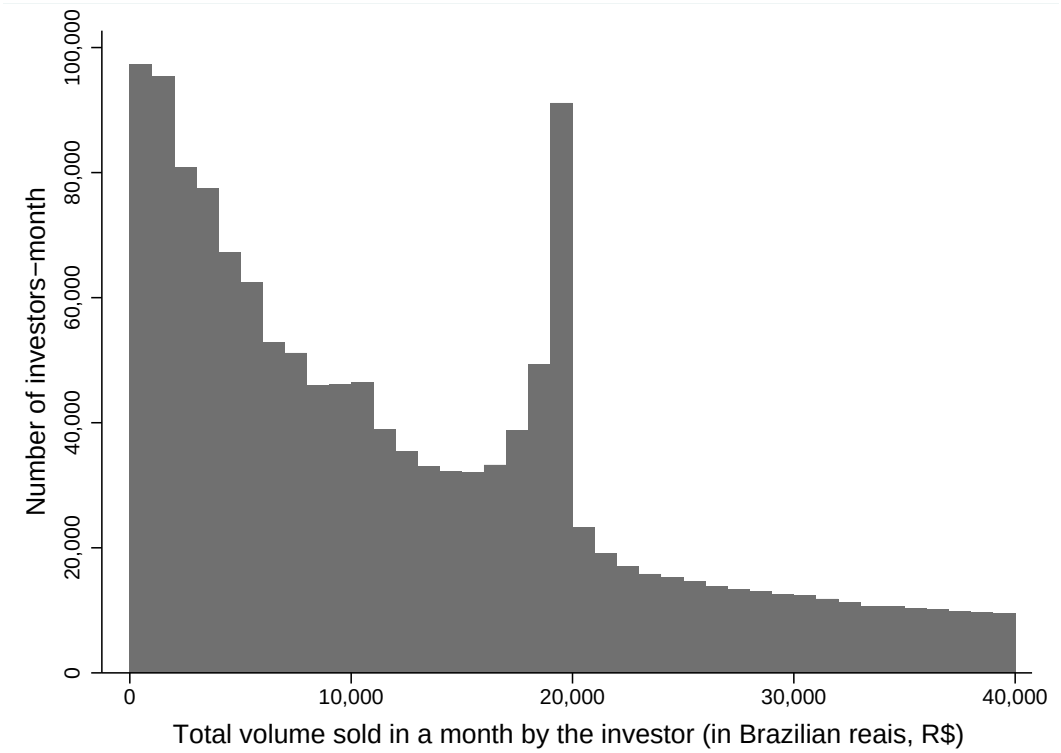

Figure 1: Histogram of individual-month selling volume
This figure shows a histogram of the total selling volume for each investor-month observation in Brazilian reais (R$) for the full sample (2012-2015) around the tax-exemption threshold of $20,000. Only investor-months with positive capital gains are included.

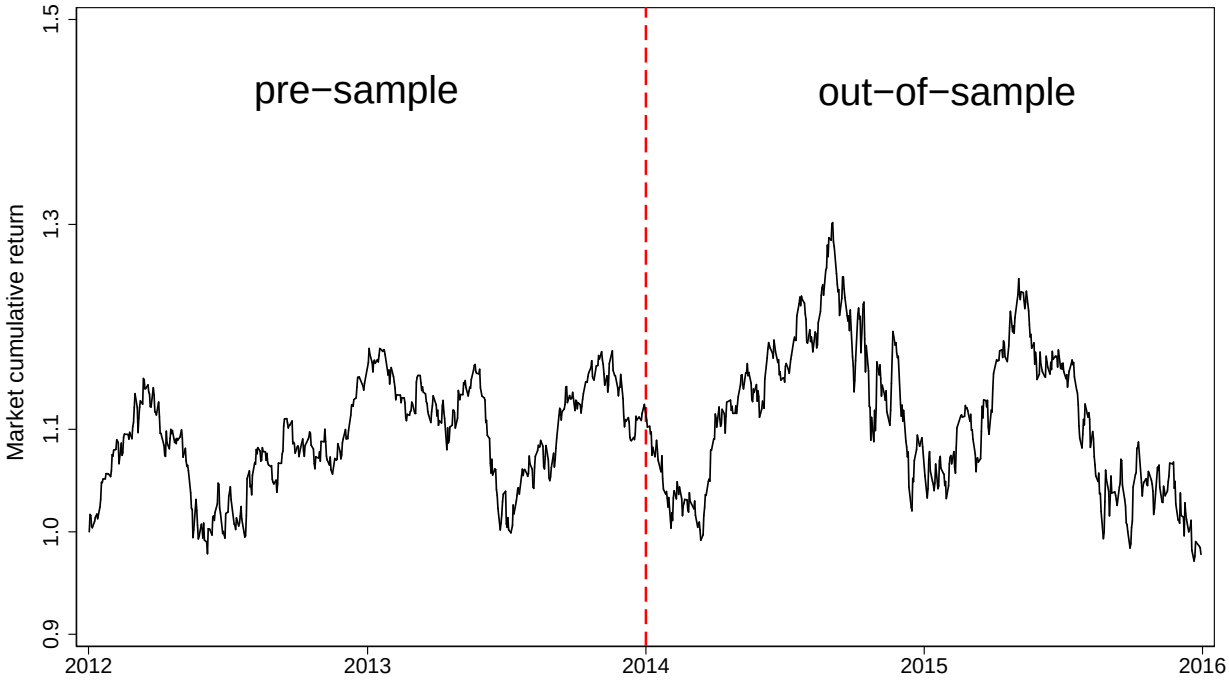

Figure 2: Index of cumulative market returns
This figure shows the cumulative return of a portfolio with all the stocks in our sample from 2012 to 2015. We use the first two years of our sample (2012-2013) to classify investors as attentive and inattentive (pre-sample). In the last two years of our sample (2014-2015) we study their out-of-sample trading behavior.

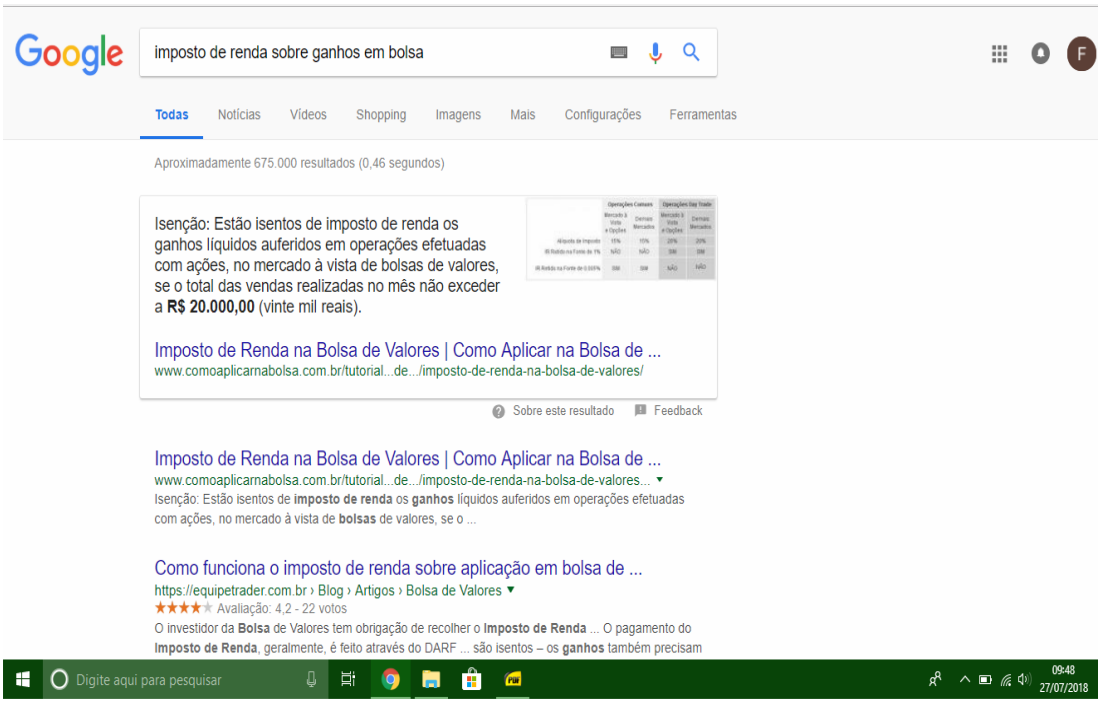

Figure 3: Google search
This figure shows the results of a google search of the term "imposto de renda sobre ganhos em bolsa" (income tax over gains in the stock market).

Table 1: Ten examples of inattention to the tax rule

This table presents ten selected examples of investor trades illustrating mistakes regarding the tax rule. In all examples the investor makes a single sale in the month, with capital gains, and exceeding the $20,000 threshold by less than $1,000. Moreover, the day of the sale is close to the end of the month and the investor presents no selling activity in the following month.

Investor ID	Volume sold ($)	Sale date	Tax ($)	Stock	Purchase date
42791	20,500	April 29, 2013	540	PETR4	February 25, 2013
153364	20,226	August 28, 2012	513	BRFS3	July 11, 2012
176972	20,070	April 29, 2013	519	PETR4	February 26, 2013
374099	20,400	October 31, 2013	535.5	PETR4	July 29, 2013
399739	20,025	November 29, 2012	1,227.9	QGEP3	July 04, 2012
454037	20,690	December 26, 2013	588.5	ESTC3	October 03, 2013
469231	20,500	June 27, 2013	1,050	EMBR3	June 20, 2012
568359	20,190	October 31, 2013	508.5	GUAR3	July 24, 2013
599764	20,258	May 27, 2013	996.9	RAPT4	June 15, 2012
1515275	20,208	August 30, 2013	691.2	CSNA3	June 21, 2013

Table 2: Descriptive statistics: 2012-2013

We define "inattentive" investors as those who, during 2012-2013, (i) sold more than $20,000 in at least one month and the amount forgave by paying taxes cannot be justified by liquidity needs or by expectation of a large price fall (i.e., made a sub-optimal decision), and (ii) never sold just below the tax-exemption threshold—between $19,500 and $20,000—while having positive capital gains (i.e., made an optimal decision). In contrast, we define "attentive" investors as those who (i) made at least one optimal decision and (ii) never made a sub-optimal decision during the months of 2012-2013. The table presents statistics based on the pre-sample period (2012-2013). For each investor we compute: i) the age at the beginning of the sample, ii) the total volume of purchases (in US$), iii) the financial volume of the average purchase (in US$), iv) the total number of purchases, v) the Herfindahl-Hirschman index for each investor based on the volume invested per stock on the last day of 2013, vi) the Herfindahl-Hirschman index for each investor based on the volume invested per industry on the last day of 2013, vii) the average 120-day future return across all purchases (in %), and viii) the average 120-day future risk-adjusted return (using a four-factor model) across all purchases (in %). In Panel A we consider all investors classified as attentive and inattentive. In Panel B we consider only "high-activity" investors classified as attentive and inattentive. High-activity investors are those who made at least one stock purchase or sale in at least half the months during 2012-2013.

Panel A: All investors

	Attentive (n=7,242)			Inattentive (n=4,688)		
	Pct 10	Pct 50	Pct 90	Pct 10	Pct 50	Pct 90
Age	31	48	68	30	46	66
Total volume invested (US$)	16,875	82,354	419,563	15,278	83,904	425,405
Average purchase (US$, stock-day)	1,321	4,292	13,232	1,249	3,731	10,741
Total num. of purchases (stock-day)	4	21	83	4	24	89
Number of stocks	1.0	3.0	10.3	1.0	3.1	9.5
Number of industries	1.0	2.4	5.9	1.0	2.4	5.7
Average 120-day ret. (%, raw)	-20.3	-2.1	10.5	-22.9	-3.9	8.3
Average 120-day ret. (%, risk adj.)	-19.5	-4.5	6.1	-21.5	-5.6	4.8

Panel B: High-activity investors

	Attentive (n=4,283)			Inattentive (n=2,662)		
	Pct 10	Pct 50	Pct 90	Pct 10	Pct 50	Pct 90
Age	31	49	68	31	47	66
Total volume invested (US$)	43,566	134,760	603,062	44,448	146,467	581,807
Average purchase (US$, stock-day)	1,221	3,961	13,894	1,163	3,433	10,607
Num. of purchases (US$, stock-day)	13	36	113	18	42	122
Number of stocks	1.2	4.1	12.4	1.3	3.9	12.1
Number of industries	1.0	3.0	6.6	1.1	3.0	6.3
Average 120-day ret. (raw)	-18.6	-2.2	8.5	-21.0	-4.2	6.5
Average 120-day ret. (risk adj.)	-18.0	-4.7	4.2	-20.2	-5.8	2.8

Table 3: Taxes paid by inattentive investors

In this table we present the distributions of (i) the tax amount paid by inattentive investors due to sub-optimal decisions (τ), the (ii) amount sold above the \$20,000 cutoff (V-\$20,000), and (iii) the ratio of the variables (the marginal tax per \$1 above the cutoff). Panel A uses our benchmark definition of a sub-optimal decision given in Equation 1. The three alternative definitions of sub-optimal decisions are used in panels B, C, and D.

Panel A: Benchmark classification of sub-optimal decision

	Mean	Std dev.	Pct 10	Pct 50	Pct 90
τ	646.52	630.96	168.96	476.38	1,273.13
V-\$20,000	1,566.28	2,333.92	102	875.50	3,698
τ/(V-\$20,000)	3.01	53.09	0.25	0.48	2.90

Panel B: Alternative classification 1: (\$20,000;\$20,500]

	Mean	Std dev.	Pct 10	Pct 50	Pct 90
τ	311.09	278.61	77.70	226.50	650.99
V-\$20,000	243.16	148.56	41	240	450
τ/(V-\$20,000)	4.96	23.60	0.27	1.11	7.62

Panel C: Alternative classification 2: τ>(V-\$20,000 + \$50)

	Mean	Std dev.	Pct 10	Pct 50	Pct 90
τ	533.90	451.87	128.10	417.12	1,057.38
V-\$20,000	246.28	283.30	21.04	160	542
τ/(V-\$20,000)	7.82	29.56	1.12	2.20	11.68

Panel D: Alternative classification 3: Last week

	Mean	Std dev.	Pct 10	Pct 50	Pct 90
τ	750.87	586.11	193.20	583.91	1,538.54
V-\$20,000	1,768.14	2,134.98	107	916	5,000
τ/(V-\$20,000)	3.34	27.58	0.25	0.49	3.74

Table 4: Descriptive statistics of dependent variables: 2014-2015

This table presents descriptive statistics of the investor-level dependent variables used in the cross-individual regressions. Variables are computed in the out-of-sample period (2014-2015). *PGR/PLR* is the ratio between the proportion of gains realized and the proportion of losses realized by the individual (an average across the individual's monthly ratios). *HHI stocks (HHI industries)* is the Herfindahl-Hirschman index for each investor based on the volume invested per stock (industry) in each month during 2014 and 2015 (the average of the monthly HHIs). *% of lottery-like stocks* is the investor's fraction of purchases of lottery-like stocks (stocks with nominal prices in the bottom tercile, and idiosyncratic volatility and skewness in the top tercile). *% of salient stocks* is the investor's fraction of purchases of salient stocks (a stock is salient if it is displayed on specialized webpages rankings as one of the five best or five worst performing stocks of the day). *% of extrapolation stocks* is the investor's fraction of purchases of stocks with a very high 20-day past return (greater than 11.1%, the 90th percentile in our 2014-2015 sample). *risk adj. ret h - mean* is the average h-day ahead risk-adjusted return across all purchases by the investor. *risk adj. ret 120 - median* is the median 120-day ahead risk-adjusted return across all purchases by the investor. *risk adj. ret 120 - minimum* is the minimum 120-day ahead risk-adjusted return across all purchases by the investor. *risk adj. ret 120 - std. dev* is the standard deviation of the 120-day ahead risk-adjusted return across all purchases by the investor.

Variable	Number of individuals	Mean	Std dev.	Pct 10	Pct 50	Pct 90
PGR/PLR	5,649	1.06	0.88	0	1	2
HHI stocks	11,930	0.57	0.29	0.20	0.54	1
HHI industries	11,930	0.65	0.26	0.30	0.64	1
% of lottery-like stocks	11,930	3.69	10.20	0	0	12.50
% of salient stocks	11,930	10.89	15.58	0	5.76	28.57
% of extrapolation stocks	11,930	9.79	15.13	0	4.66	25
risk adj. ret 60 - mean	11,930	-4.24	9.96	-15.07	-3.67	5.32
risk adj. ret 120 - mean	11,930	-5.01	13.30	-19.55	-5.20	8.88
risk adj. ret 240 - mean	11,930	-11.26	18.48	-32.17	-11.11	7.55
risk adj. ret 120 - median	11,930	-6.55	14.04	-22.06	-6.81	8.90
risk adj. ret 120 - min	11,930	-35.91	22.98	-66.76	-36.52	-9.13
risk adj. ret 120 - std. dev.	10,969	22.11	12.02	10.06	20.38	34.75

Table 5: Disposition effect

This table shows cross-individual regressions for a measure of disposition effect on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). The dependent variable is PGR/PLR, where PGR is the Proportion of Gains Realized and PLR is the Proportion of Losses Realized. PGR/PLR is winsorized at 2.5% and 97.5%. We include as controls the demeaned variables *performance*, the average 120-day return across all purchases by the individual during 2012-2013, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Columns 1, 2, and 3 consider all investors classified as attentive and inattentive, and columns 4, 5, and 6 consider only "high-activity" investors. High-activity investors are those who made at least one stock purchase or sale in at least half of the months in 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All investors			High-activity investors		
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	0.035**	0.034**	0.031*	0.047**	0.043**	0.038*
	(0.017)	(0.017)	(0.017)	(0.020)	(0.020)	(0.020)
performance		-0.003***	-0.002***		-0.005***	-0.004***
		(0.001)	(0.001)		(0.001)	(0.001)
short-seller		-0.044**	-0.076***		-0.057**	-0.092***
		(0.020)	(0.020)		(0.023)	(0.023)
options-trader		0.004	-0.002		0.003	-0.002
		(0.020)	(0.019)		(0.023)	(0.023)
volume			-0.001			0.007
			(0.009)			(0.010)
# of months			-0.011***			-0.013***
			(0.002)			(0.003)
# of days			0.004***			0.003***
			(0.001)			(0.001)
Constant	0.986***	0.992***	0.978***	0.992***	1.003***	0.987***
	(0.011)	(0.012)	(0.012)	(0.013)	(0.014)	(0.014)
R^2	0.08%	0.51%	4.52%	0.13%	1.11%	6.06%
N	5,649	5,649	5,649	4,059	4,059	4,059

Table 6: Diversification

This table shows cross-individual regressions of two measures of diversification on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). The dependent variable is the Herfindahl-Hirschman index based on the volume invested per stock (industry) in each month during 2014 and 2015. *HHI Stocks* (*HHI industries*) is the average across all months for each investor based on the position per stock (industry). We include as controls the demeaned variables *performance*, the average 120-day return across all purchases by the individual during 2012-2013, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Columns 1 to 4 consider all investors classified as attentive and inattentive, and columns 5 to 8 consider only "high-activity" investors. High-activity investors are those who made at least one stock purchase or sale in at least half the months in 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All investors				High-activity investors			
	HHI stocks		HHI industries		HHI stocks		HHI industries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
inattentive	0.011**	0.009*	0.007	0.005	0.021***	0.021***	0.016***	0.016***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.006)
performance		-0.001***		-0.001***		-0.003***		-0.003***
		(0.0001)		(0.0001)		(0.001)		(0.0001)
short-seller		-0.009		-0.016**		-0.004		-0.013
		(0.008)		(0.007)		(0.009)		(0.008)
options-trader		0.017***		0.024***		0.012		0.020***
		(0.006)		(0.005)		(0.008)		(0.007)
volume		0.026***		0.024***		0.028***		0.026***
		(0.003)		(0.006)		(0.004)		(0.003)
# of months		-0.011***		-0.009***		-0.009***		-0.008***
		(0.001)		(0.0001)		(0.001)		(0.001)
# of days		-0.001***		-0.001***		-0.001***		-0.001***
		(0.0001)		(0.0001)		(0.0001)		(0.0001)
constant	0.565***	0.564***	0.646	0.644***	0.500***	0.497***	0.590***	0.587***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.004)
R^2	0.03%	12.08%	0.02%	8.14%	0.13%	7.83%	0.10%	7.34%
N	11,930	11,930	11,930	11,930	6,945	6,945	6,945	6,945

Table 7: Preference for lottery-like stocks

This table shows cross-individual regressions of the preference for lottery-like stocks on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). The dependent variable is the fraction of purchases of lottery-like stocks (stocks with nominal prices in the bottom tercile, and idiosyncratic volatility and skewness in the top tercile). We include as controls the demeaned variables *performance*, the average 120-day return across all purchases by the individual during 2012-2013, *volume*, the average volume across all purchases by investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Columns 1 to 3 consider all investors classified as attentive and inattentive, and columns 4 to 6 consider only "high-activity" investors. High-activity investors are those who made at least one stock purchase or sale in at least half the months during 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All investors			High-activity investors		
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	1.166***	1.030***	0.931***	1.395***	1.130***	0.922***
	(0.199)	(0.201)	(0.199)	(0.266)	(0.263)	(0.264)
performance		-0.104***	-0.096***		-0.190***	-0.179***
		(0.010)	(0.010)		(0.015)	(0.015)
short-seller		-0.935***	-1.184***		-1.197***	-1.193***
		(0.265)	(0.269)		(0.308)	(0.310)
options-trader		0.016	-0.120		-0.456	-0.393
		(0.235)	(0.236)		(0.285)	(0.286)
volume			-0.827***			-0.759***
			(0.110)			(0.142)
# of months			0.041**			-0.031
			(0.018)			(0.039)
# of days			0.022***			0.021***
			(0.003)			(0.003)
Constant	3.235***	3.410***	3.509***	3.742***	4.160***	4.223***
	(0.110)	(0.122)	(0.122)	(0.148)	(0.169)	(0.169)
R^2	0.31%	2.63%	4.32%	0.43%	5.57%	6.83%
N	11,930	11,930	11,930	6,945	6,945	6,945

Table 8: Preference for salient stocks

This table shows cross-individual regressions of the preference for salient stocks on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). The dependent variable is the fraction of purchases of salient stocks. Salient stocks is a dummy variable equal to one if the stock is displayed on specialized webpages rankings as one of the five best and five worst performing stocks of the day. We include as controls the demeaned variables *performance*, the average 120-day return across all purchases by the individual during 2012-2013, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Columns 1 to 3 consider all investors classified as attentive and inattentive, and columns 4 to 6 consider only "high-activity" investors. High-activity investors are those who made at least one stock purchase or sale in at least half the months during 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All investors			High-activity investors		
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	0.886***	1.013***	0.942***	1.292***	1.396***	1.300***
	(0.292)	(0.294)	(0.297)	(0.329)	(0.334)	(0.336)
performance		-0.028**	-0.028**		-0.055***	-0.053***
		(0.012)	(0.012)		(0.015)	(0.015)
short-seller		-1.950***	-1.841***		-1.721***	-1.799***
		(0.375)	(0.378)		(0.399)	(0.400)
options-trader		-0.433	-0.314		-0.630*	-0.609*
		(0.344)	(0.347)		(0.219)	(0.376)
volume			0.174			0.301
			(0.151)			(0.165)
# of months			-0.114***			-0.279***
			(0.030)			(0.054)
# of days			0.009**			0.014***
			(0.004)			(0.004)
Constant	10.540***	10.837***	10.826***	10.076***	10.484***	10.529***
	(0.183)	(0.199)	(0.196)	(0.198)	(0.219)	(0.219)
R^2	0.08%	0.36%	0.50%	0.23%	0.80%	1.22%
N	11,930	11,930	11,930	6,945	6,945	6,945

Table 9: Extrapolation

This table shows cross-individual regressions of the preference for extrapolative stocks on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). The dependent variable is the fraction of "purchases by extrapolation." A purchase by extrapolation is the purchase of a stock whose past 20-day returns is above 11.1%, the 90th percentile in our sample (2014-2015). We include as controls the demeaned variables *performance*, the average 120-day return across all purchases by the individual during 2012-2013, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Columns 1 to 3 consider all investors classified as attentive and inattentive, and columns 4 to 6 consider only "high-activity" investors. High-activity investors are those who made at least one stock purchase or sale in at least half the months during 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All investors			High-activity investors		
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	1.331***	1.103***	1.068***	1.431***	1.097***	1.120***
	(0.285)	(0.286)	(0.286)	(0.325)	(0.323)	(0.322)
performance		-0.074***	-0.075***		-0.099***	-0.100***
		(0.012)	(0.012)		(0.014)	(0.015)
short-seller		0.919***	0.934**		0.815	0.715
		(0.402)	(0.409)		(0.434)	(0.440)
options-trader		0.110	0.159		0.365	0.319
		(0.341)	(0.344)		(0.383)	(0.386)
volume			0.191			0.241
			(0.158)			(0.181)
# of months			-0.073**			-0.014
			(0.030)			(0.055)
# of days			0.009**			0.004
			(0.004)			(0.004)
Constant	9.267***	9.213***	9.215***	9.076***	8.975***	8.995***
	(0.178)	(0.192)	(0.190)	(0.200)	(0.224)	(0.223)
R^2	0.21%	0.75%	0.81%	0.28%	1.20%	1.23%
N	11,930	11,930	11,930	6,945	6,945	6,945

Table 10: Biases index

This table shows cross-individual regressions of the bias index on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). For each investor, we compute the average quintile across all biases: underdiversification (HHI-stocks), disposition effect, preference for salient stocks, preference for lottery-like stocks, and extrapolation. We include as controls the demeaned variables *performance*, the average 120-day return across all purchases by the individual during 2012-2013, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Columns 1 to 3 consider all investors classified as attentive and inattentive, and columns 4 to 6 consider only "high-activity" investors. High-activity investors are those who made at least one stock purchase or sale in at least half the months during 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All investors			High-activity investors		
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	0.144***	0.127***	0.121***	0.204***	0.179***	0.163***
	(0.015)	(0.015)	(0.015)	(0.020)	(0.019)	(0.019)
performance		-0.008***	-0.007***		-0.014***	-0.013***
		(0.001)	(0.001)		(0.001)	(0.001)
short-seller		-0.050**	-0.120***		-0.090***	-0.135***
		(0.022)	(0.021)		(0.026)	(0.025)
options-trader		0.070***	0.036**		0.036	0.023
		(0.018)	(0.018)		(0.022)	(0.022)
volume			-0.022**			-0.005
			(0.008)			(0.010)
# of months			-0.001			-0.002
			(0.002)			(0.003)
# of days			0.005***			0.005***
			(0.001)			(0.001)
Constant	2.550***	2.549***	2.568***	2.618***	2.634***	2.652***
	(0.015)	(0.010)	(0.010)	(0.012)	(0.013)	(0.013)
R^2	0.77%	2.91%	8.22%	1.55%	6.45%	11.09%
N	11,930	11,930	11,930	6,945	6,945	6,945

Table 11: Performance - purchases

This table shows cross-individuals regressions of out-of-sample (2014-2015) stock-picking performance on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). The dependent variable, stock-picking performance, is the average of R_{t+h}, the risk-adjusted h-day ahead return (using the four-factor model), across all purchases by the investor during 2014-2015 (excluding day-trades). We consider horizons of h=60, 120, and 240 trading days. We include as controls *performance*, the same stock-picking performance measure computed using purchases in 2012-2013, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variable *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Panel A reports results for all investors. Panel B reports results for high-activity investors, defined as those who made at least one stock purchase or sale in at least half the months during 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: All investors

	60-day		120-day		240-day	
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	-0.390**	-0.355*	-0.719***	-0.627**	-1.287***	-1.067***
	(0.190)	(0.192)	(0.252)	(0.254)	(0.346)	(0.353)
performance		0.056***		0.077***		0.107***
		(0.014)		(0.014)		(0.012)
short-seller		0.460*		0.163		0.363
		(0.241)		(0.329)		(0.512)
options-trader		-0.365		-0.714**		-0.469
		(0.222)		(0.305)		(0.432)
volume		-0.183*		-0.402***		-0.256
		(0.102)		(0.133)		(0.204)
# of months		0.056***		-0.018		0.078**
		(0.018)		(0.025)		(0.035)
# of days		-0.001		-0.007**		-0.001
		(0.002)		(0.003)		(0.005)
constant	-4.090***	-4.092***	-4.730***	-4.643***	-10.756***	-10.796***
	(0.113)	(0.122)	(0.153)	(0.166)	(0.218)	(0.232)
R^2	0.04%	0.44%	0.07%	0.78%	0.12%	1.14%
N	11,930	11,930	11,930	11,930	11,930	11,930

Table 11 – Continued

Panel B: High-activity investors

	60-day		120-day		240-day	
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	-0.522**	-0.405*	-0.923***	-0.794***	-1.717***	-1.483***
	(0.207)	(0.207)	(0.290)	(0.294)	(0.424)	(0.436)
performance		0.092***		0.087***		0.134***
		(0.018)		(0.017)		(0.018)
short-seller		0.422*		0.567		0.611
		(0.244)		(0.360)		(0.582)
options-trader		-0.343		-0.820**		-0.393
		(0.237)		(0.330)		(0.492)
volume		-0.220**		-0.274*		-0.368
		(0.106)		(0.156)		(0.259)
# of months		0.149***		0.008		0.121*
		(0.034)		(0.049)		(0.070)
# of days		-0.004*		-0.004		-0.001
		(0.003)		(0.004)		(0.006)
constant	-3.843***	-3.877***	-4.881***	-4.828***	-10.371***	-10.470***
	(0.128)	(0.143)	(0.184)	(0.204)	(0.274)	(0.300)
R^2	0.09%	1.05%	0.14%	0.88%	0.23%	1.53%
N	6,945	6,945	6,945	6,945	6,945	6,945

Table 12: Performance - other metrics

This table shows cross-individual regressions of four alternative out-of-sample (2014-2015) measures of trading performance on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). The alternative measures of performance are the median, minimum, and standard deviation of R_{t+h}, the risk-adjusted 120-day ahead return (using the four-factor model), across all purchases by the investor during 2014-2015 (excluding day-trades). We also compute the Sharpe ratio of the investor i by computing the average 120-day ahead return in excess of the risk-free rate divided by the standard deviation of the 120-day ahead return across all purchases (winsorized at 1% and 99%). We include as controls *performance*, the average risk-adjusted return 120-day ahead across all purchases i during 2012-2013, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Panel A reports results for all investors. Panel B reports results for high-activity investors, defined as those who made at least one stock purchase or sale in at least half the months during 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: All investors, 120-day

	median		minimum		standard deviation		Sharpe ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
inattentive	-1.032***	-0.922***	-3.335***	-2.948***	1.642***	1.465***	-0.095***	-0.093***
	(0.265)	(0.267)	(0.430)	(0.401)	(0.238)	(0.236)	(0.020)	(0.020)
performance		0.086***		0.105***		-0.071***		0.006***
		(0.014)		(0.019)		(0.013)		(0.001)
short-seller		0.490		3.294***		-1.988***		0.106***
		(0.355)		(0.554)		(0.303)		(0.026)
options-trader		-0.709**		-1.126**		0.192		-0.025
		(0.326)		(0.487)		(0.286)		(0.023)
volume		-0.346**		1.722***		-1.124***		-0.030**
		(0.142)		(0.220)		(0.126)		(0.012)
# of months		-0.036		-0.508***		0.056**		0.007***
		(0.027)		(0.042)		(0.024)		(0.002)
# of days		-0.020***		-0.185***		0.054***		-0.001***
		(0.004)		(0.008)		(0.004)		(0.000)
constant	-6.147***	-6.111***	-34.600***	-34.958***	21.463***	21.653***	-0.204***	-0.216**
	(0.163)	(0.174)	(0.269)	(0.265)	(0.142)	(0.151)	(0.013)	(0.014)
R^2	0.13%	1.18%	0.50%	16.63%	0.45%	5.76%	0.20%	0.92%
N	11,930	11,930	11,930	11,930	10,969	10,969	10,969	10,969

Table 12 – Continued

Panel B: High-activity investors, 120-day

	median		minimum		standard deviation		Sharpe ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
inattentive	-1.269***	-1.073***	-4.225***	-3.311***	1.875***	1.486***	-0.089***	-0.089***
	(0.309)	(0.314)	(0.535)	(0.505)	(0.305)	(0.301)	(0.018)	(0.018)
performance		0.115***		0.189***		-0.139***		0.006***
		(0.018)		(0.027)		(0.017)		(0.001)
short-seller		0.928**		3.943***		-2.037***		0.114***
		(0.395)		(0.647)		(0.365)		(0.023)
options-trader		-0.824**		-0.908		-0.015		-0.045**
		(0.355)		(0.574)		(0.348)		(0.020)
volume		-0.283*		1.688***		-0.977***		-0.016
		(0.171)		(0.272)		(0.160)		(0.010)
# of months		-0.002		-0.516***		-0.001		0.004
		(0.052)		(0.084)		(0.049)		(0.003)
# of days		-0.017***		-0.170***		0.052***		-0.001**
		(0.004)		(0.008)		(0.005)		(0.000)
constant	-6.560***	-6.594***	-39.183***	-39.983***	22.425***	22.872***	-0.180***	-0.180***
	(0.197)	(0.217)	(0.338)	(0.341)	(0.180)	(0.195)	(0.012)	(0.012)
R^2	0.24%	1.52%	0.88%	16.07%	0.59%	6.86%	0.40%	1.69%
N	6,945	6,945	6,945	6,945	6,643	6,643	6,643	6,643

Table 13: Alternative classifications of inattention

This table reports t-statistics for the inattentive dummy for the main regressions of this paper using different samples of investors based on alternative classifications of inattention. In ($20,000;$20,500], the sub-optimal choice is defined as monthly sale volumes within this interval with τ>$50. In τ>(V-$20,000+$50), the sub-optimal choice occurs if the amount sold above the threshold is smaller than the taxes paid plus $50. In "Last week," we apply our benchmark criterion (Equation 1) but we consider only investor-months where the first sale occurred in the last week of the month. In "Trailing capital losses," we apply our benchmark criterion (Equation 1) but exclude months where the investor has trailing capital losses. In all four classifications, we define an investor as inattentive if we observe a sub-optimal decision in at least one month during 2012-2013 and we observe no month where, having capital gains, the investor sells a volume "just below" the $20,000 threshold. Attentive investors are defined as those who in at least one month sell a volume just below the $20,000 threshold (from $19,500.01 to $20,000) and present no sub-optimal decision. For each classification, we report results separately for all investors (ALL) and high-activity investors (HA). High-activity investors are those who made at least one stock purchase in at least half the months during 2012-2013. The estimates are from the specification that includes all controls (*performance*, *volume*, *# of months*, and *# of days*, *short-seller*, and *option-trader*). We include estimates from the bias index, disposition effect (DE), diversification (both HHI-Stocks and HHI-Industries), lottery-like, salience, and extrapolation regressions. We also include the estimates of performance regressions: mean, median, minimum, standard deviation, and the Sharpe ratio (SR) of the 120-day future returns across all purchases by the investor.

		# of investors		t-statistics of "inattentive" (regressions with all controls)											
				behavioral biases							performance (h=120)				
Alternative classifications		att.	inatt.	index	DE	HHI-S	HHI-I	lottery	salient	extrap.	mean	median	min	std. dev.	SR
($20,000; $20,500]	ALL	7,582	2,187	6.69	2.11	6.47	5.75	1.01	2.85	2.23	-1.76	-1.92	-3.43	1.98	-3.37
	HA	4,544	1,276	6.32	1.49	6.00	5.73	0.55	2.64	2.95	-1.22	-1.24	-2.76	1.71	-2.99
$\tau > (V - \$20,000 + \$50)$	ALL	7,750	1,071	5.07	0.99	1.74	1.37	2.72	1.18	1.48	-0.65	-0.98	-3.78	3.23	-2.97
	HA	4,671	611	5.42	0.90	1.61	1.77	2.53	1.46	1.72	-1.05	-1.34	-4.67	3.33	-2.93
Last week	ALL	2,020	767	5.24	2.18	1.22	1.16	2.50	3.34	1.81	-1.97	-2.48	-3.53	2.52	-1.49
	HA	1,187	403	4.75	2.68	2.25	1.97	1.95	2.87	1.84	-3.04	-3.16	-3.47	1.99	-3.93
Trailing capital losses	ALL	7,366	3,837	6.79	2.73	-0.17	-0.53	3.97	3.15	2.75	-2.43	-3.18	-6.75	5.30	-3.98
	HA	4,393	2,047	7.13	2.87	1.26	1.15	2.84	3.68	2.50	-2.50	-2.95	-5.82	4.05	-4.40

Table 14: In-sample classifications of inattention

This table reports t-statistics for the inattentive dummy for the main regressions of this paper using an in-sample classification of investors. In this table we use the years 2014-2015 to classify investors as inattentive and, as before, run the regressions for the years 2014-2015. We consider our benchmark classification as well as three alternative classifications of inattention. In ($20,000;$20,500], the sub-optimal choice is defined as monthly sales volume within this interval with τ>$50. In τ>(V-$20,000+$50), the sub-optimal choice occurs if the amount sold above the threshold is smaller than the taxes paid plus $50. In "Last week", we apply our benchmark criterion (Equation 1), but we consider only investor-months where the first sale occurred in the last week of the month. In "Trailing capital losses," we apply our benchmark criterion (Equation 1), but exclude months where the investor has trailing capital losses. In all four classifications, we define an investor as inattentive if we observe a sub-optimal decision in at least one month during 2014-2015 and we observe no month where the investor, having capital gains, sells a volume "just below" the $20,000 threshold. Attentive investors are those who in at least one month sell a volume just below the $20,000 threshold (from $19,500.01 to $20,000) and present no sub-optimal decision. For each classification, we report results separately for all investors (ALL) and high-activity investors (HA). High-activity investors are those who made at least one stock purchase in at least half the months during 2014-2015. The estimates are from the specification that includes all controls (*performance*, *volume*, *# of months*, and *# of days*, *short-seller*, and *option-trader*). We include estimates from the bias index, disposition effect (DE), diversification (both HHI-Stocks and HHI-Industries), lottery-like, salience, and extrapolation regressions. We also include the estimates of performance regressions: mean, median, minimum, standard deviation, and the Sharpe ratio (SR) of the 120-day future returns across all purchases by the investor.

		# of investors		t-statistics of "inattentive" (regressions with all controls)											
						behavioral biases					performance (h=120)				
Alternative classifications		att.	inatt.	index	DE	HHI-S	HHI-I	lottery	salient	extrap.	mean	median	min	std. dev.	SR
benchmark	ALL	5,947	4,343	10.71	3.31	2.37	2.67	9.54	2.51	4.79	-3.25	-5.57	-11.90	12.02	-7.89
	HA	2,711	2,001	9.37	4.10	2.01	2.36	7.50	3.45	3.10	-2.68	-4.32	-10.83	9.52	-6.84
($20,000;$20,500]	ALL	6,176	1,694	6.60	3.01	3.78	3.53	0.70	0.77	4.64	-3.46	-4.30	-9.12	2.35	-4.62
	HA	2,826	790	6.16	3.57	2.96	2.90	1.42	0.10	3.66	-0.37	-1.19	-5.19	3.73	-3.68
$\tau > (V - \$20,000 + \$50)$	ALL	6,255	1,000	3.50	1.02	1.08	1.41	3.12	0.35	3.09	-2.05	-2.71	-4.41	3.74	-3.13
	HA	2,869	440	3.91	1.46	1.41	1.03	3.08	-0.30	2.00	-0.02	-2.22	-4.74	4.55	-2.35
Last week	ALL	1,725	817	6.88	3.08	3.47	2.87	3.34	1.03	2.52	-1.50	-2.83	-4.57	4.92	-4.11
	HA	779	362	6.43	3.01	3.01	2.24	2.01	2.04	1.34	-2.27	-3.09	-5.71	3.80	-2.74
Trailing capital losses	ALL	6,119	2,572	6.21	4.15	1.91	2.64	6.21	4.36	0.85	-2.59	-4.70	-6.32	7.91	-5.62
	HA	2,828	912	6.46	5.24	1.40	2.22	4.20	5.09	-2.03	-2.26	-3.96	-6.06	5.88	-4.57

Table 15: Placebo (other thresholds, all investors)

This table reports t-statistics for the inattentive dummy for the main regressions of the paper using classifications of inattention for placebo tax-exemption thresholds ($10,000, $40,000, $60,000, $80,000, and $100,000). For instance, at the $40,000 threshold, we define an investor as "inattentive" if the investor, during 2012-2013, (i) had capital gains sold just above this threshold—between $40,000 and $40,500—and paid at least $50 in taxes in at least one month, and (ii) never sold just below this threshold—between $39,500 and $40,000—while having positive capital gains. In contrast, we say an investor is "attentive" if the investor sold between $39,500 and $40,000 at least once and never did (i) during the months of 2012-2013. For reference, we also include the main results for the true $20,000 threshold (these are the same t-statistics presented in the first two rows of Table 13). Panel A reports results for all investors, and Panel B reports results for high-activity investors (HA), defined as those who made at least one stock purchase in at least half the months during 2012-2013. The estimates are from the specification that includes all controls (*performance*, *volume*, *# of months*, and *# of days*, *short-seller*, and *option-trader*). We include estimates from the bias index, disposition effect (DE), diversification (both HHI-Stocks and HHI-Industries), lottery-like, salience, and extrapolation regressions. We also include the estimates of performance regressions: mean, median, minimum, standard deviation, and the Sharpe ratio (SR) of the 120-day future returns across all purchases by the investor.

Panel A: All investors

	# of investors		t-statistics of "inattentive" (regressions with all controls)											
			behavioral biases							performance (h=120)				
threshold	att.	inatt.	index	DE	HHI-S	HHI-I	lottery	salient	extrap.	mean	median	min	std. dev.	SR
$10,000	5,145	3,907	-1.65	0.53	-2.45	-2.55	-0.22	0.03	-2.49	-1.08	-0.49	-1.26	-0.51	0.82
$20,000	**7,582**	**2,187**	**6.69**	**2.11**	**6.47**	**5.75**	**1.01**	**2.85**	**2.23**	**-1.76**	**-1.92**	**-3.43**	**1.98**	**-3.38**
$40,000	1,239	1,057	1.07	-0.06	1.14	1.16	0.47	1.53	0.45	0.70	0.36	0.81	-0.31	0.29
$60,000	704	688	-0.94	-0.92	0.19	-0.33	-0.20	1.51	-1.22	1.21	0.88	2.29	0.78	0.50
$80,000	532	453	0.15	-0.04	-0.55	-0.35	-0.75	1.22	0.39	-0.46	-0.72	-0.02	-0.17	0.14
$100,000	472	393	-1.32	0.72	-0.41	-0.16	-0.64	-0.94	-1.45	-1.28	-0.64	-1.37	-2.19	0.30

Panel B: High-activity investors

	# of investors		t-statistics of "inattentive" (regressions with all controls)											
			behavioral biases							performance (h=120)				
threshold	att.	inatt.	index	DE	HHI-S	HHI-I	lottery	salient	extrap.	mean	median	min	std. dev.	SR
$10,000	2,785	2,116	-1.38	-0.15	-1.75	-2.34	1.47	-0.75	-1.58	-1.38	-0.65	-0.60	-0.43	-0.84
$20,000	**4,544**	**1,276**	**6.32**	**1.49**	**6.00**	**5.73**	**0.55**	**2.64**	**2.95**	**-1.22**	**-1.24**	**-2.76**	**1.71**	**-3.04**
$40,000	812	698	1.29	-0.18	0.78	0.56	0.94	0.70	0.76	0.47	0.68	0.42	-0.08	0.75
$60,000	511	475	0.50	1.70	-0.31	-0.64	0.74	0.97	-0.62	1.06	0.79	1.52	0.85	0.48
$80,000	385	348	-0.60	0.74	-0.24	0.04	-2.25	0.64	0.73	0.42	0.25	1.11	-0.91	-0.51
$100,000	342	280	-0.45	0.56	0.54	0.73	0.46	0.18	-2.13	-1.50	-0.59	1.19	-1.55	-0.43

Online Appendix
Table A1: Inattention persistence

This table shows that inattention in the first half of the sample (2012-2013) is predictive of inattention in the second half of the sample (2014-2015). We define an investor as "inattentive" during 2012-2013 or 2014-2015 if the investor (i) sold more than $20,000 in at least one month and the amount forgave by paying taxes cannot be justified by liquidity needs or by expectation of a large price fall (i.e., made a sub-optimal decision), and (ii) never sold just below the tax-exemption threshold—between $19,500 and $20,000—while having positive capital gains (i.e., made an optimal decision). In contrast, we define an investor as "attentive" if the investor made at least one optimal decision (ii) and never made a sub-optimal decision (i). We include as controls *performance*, the stock-picking performance measure computed using purchases in 2012-2013 for the respective horizons, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Columns (1) and (2) consider all investors classified as attentive and inattentive in the pre-sample. Columns (3) and (4) consider only "high-activity" investors classified as attentive and inattentive in the pre-sample. High-activity investors are those who made at least one stock purchase or sale in at least half the months during 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Inattentive in 2014-2015			
	All investors		High-activity investors	
	(1)	(2)	(3)	(4)
inattentive	0.038***	0.038***	0.052***	0.049***
	(0.005)	(0.005)	(0.008)	(0.008)
performance		-0.001		-0.001**
		(0.001)		(0.000)
short-seller		-0.023***		-0.027***
		(0.008)		(0.010)
options-trader		0.005		0.014
		(0.007)		(0.009)
volume		-0.008***		-0.011***
		(0.003)		(0.004)
# of months		0.001**		0.001
		(0.001)		(0.001)
# of days		0.001***		0.001***
		(0.000)		(0.000)
constant	0.068***	0.003***	0.080***	0.082***
	(0.003)	(0.141)	(0.004)	(0.004)
R^2	0.01%	0.62%	0.07%	1.09%
N	11,930	11,930	6,945	6,945

Table A2: Performance - volume-weighted purchases

This table shows cross-individual regressions for out-of-sample (2014-2015) stock-picking performance on *inattentive*, a dummy variable equal to one (zero) if the investor is classified as inattentive (attentive) in the pre-sample (2012-2013). We measure stock-picking performance by taking the volume-weighted average of R_{t+h}, the risk-adjusted h-day ahead return (using the four-factor model), across all purchases by the investor during 2014-2015 (excluding day-trades). We consider horizons of h=60, 120, and 240 trading days. We include as controls *performance*, the same stock-picking performance measure computed using purchases in 2012-2013, *volume*, the average volume across all purchases by the investor during 2012-2013, *# of months*, the number of months the investor was active (bought or sold a stock) in the stock market during 2012-2013, and *# of days*, the number of days the investor was active in the stock market during 2012-2013. We also include as control variables *short-seller*, a dummy variable equal to one if the investor was a short-seller during 2012-2013, and *option-trader*, a dummy variable equal to one if the investor was an option trader during 2012-2013. Panel A reports results for all investors, and Panel B reports results for high-activity investors (HA), defined as those who made at least one stock purchase in at least half the months during 2012-2013. Standard errors are shown in parenthesis and are robust. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: All investors

	60-day		120-day		240-day	
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	-0.504***	-0.474**	-0.884***	-0.804***	-1.361***	-1.212***
	(0.191)	(0.193)	(0.258)	(0.259)	(0.345)	(0.352)
performance		0.064***		0.076***		0.097***
		(0.014)		(0.014)		(0.012)
short-seller		0.732		0.182		0.760
		(0.254)		(0.340)		(0.518)
options-trader		-0.539**		-0.710**		-0.620
		(0.230)		(0.316)		(0.435)
volume		-0.254**		-0.516***		-0.473**
		(0.103)		(0.136)		(0.204)
# of months		0.073***		-0.002		0.079**
		(0.019)		(0.026)		(0.035)
# of days		-0.001		-0.007*		0.000
		(0.003)		(0.004)		(0.005)
constant	-4.453***	-4.453***	-5.113***	-5.025***	-11.259***	-11.294***
	(0.116)	(0.125)	(0.155)	(0.167)	(0.216)	(0.228)
R^2	0.06%	0.69%	0.10%	0.77%	0.13%	1.06%
N	11,930	11,930	11,930	11,930	11,930	11,930

Table A2 – Continued

Panel B: High-activity investors

	60-day		120-day		240-day	
	(1)	(2)	(3)	(4)	(5)	(6)
inattentive	-0.658***	-0.565***	-1.228***	-1.124***	-1.789***	-1.629***
	(0.217)	(0.218)	(0.295)	(0.296)	(0.412)	(0.423)
performance		0.095***		0.081***		0.122***
		(0.019)		(0.018)		(0.018)
short-seller		0.657**		0.682*		1.096*
		(0.261)		(0.369)		(0.579)
options-trader		-0.476*		-0.737**		-0.755
		(0.256)		(0.348)		(0.489)
volume		-0.354***		-0.437***		-0.551**
		(0.114)		(0.161)		(0.257)
# of months		0.163***		0.069		0.136**
		(0.035)		(0.049)		(0.068)
# of days		-0.004		-0.006		0.001
		(0.003)		(0.004)		(0.006)
constant	-4.100***	-4.132***	-5.183***	-5.160***	-10.872***	-10.937***
	(0.132)	(0.146)	(0.186)	(0.204)	(0.269)	(0.292)
R^2	0.13%	1.25%	0.25%	0.94%	0.26%	1.54%
N	6,945	6,945	6,945	6,945	6,945	6,945