Investor Behavior under Fiscal Policy Changes*

Nicolas Dierick Koen Inghelbrecht Hannes Stieperaere†

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Abstract

Capital gain taxes influence the trading behavior of retail investors and have positive externalities in the form of lower systematic investment mistakes. Our results using real trading data show that investors are less inclined to sell winning position after the introduction of the tax. As a result, the disposition effect is reduced by almost 50%.

Keywords: Investor behavior, Disposition effect, Capital gain tax
JEL Codes: G02, G11, G14

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†All authors are from Ghent University's department of Financial Economics. Address correspondence to Hannes Stieperaere, Department of Financial Economics, Sint Pietersplein 5, 9000 Ghent, Belgium or e-mail: Hannes.Stieperaere@UGent.be.

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1 Introduction

The impact of policy changes on investor behavior cannot be neglected. In 2016, the Belgian government introduced a tax on realized stock trading gains for retail investors, without allowing to deduct losses. This asymmetric capital gain tax resulted in a 27% drop in transaction volume for medium sized Belgian stocks, the Bel Mid-index, in the first 11 months after the tax was introduced (De Tijd, 2016). The Small companies index, Bel Small, even lost 43% in transaction volume. The purpose of this short-term capital gain tax was to lower speculative behavior of retail investors. Therefore, it was called *"the speculation tax"*. When stocks were sold within the first 6 months, capital gains were subject to a 33% taxation. As a result, investors were inclined to postpone the selling of winning stocks to avoid taxes. In contrast to the taxation of gains, deducting losses was not possible.

As suggested by the drastic drop in trading activity on Euronext Brussels, investors' trading behavior changed. In this study, we focus on the change in systematic investment mistakes before and after the introduction of this tax. One of the most robust findings in the literature of investor behavior is the disposition effect. This investor bias, introduced by Shefrin et al. (1985) and inspired by the prospect theory of Kahneman and Tversky (1979), demonstrates that individual investors are more likely to realize gains than to realize losses. Because deducting losses is not possible under this speculation tax, we do not expect a change in the probability to realize losses. However, we do expect investors to be less inclined to sell taxable winning positions. Because the disposition effect is caused by a higher probability to realize gains than losses, and realizing gains is discouraged, we anticipate a lower disposition effect. Furthermore, Odean (1999) showed that securities bought by individual investors subsequently underperform those they sell. Hence, investors who are more disposition prone, and sell winning stocks too quickly, have on average lower portfolio performance. Thus, limiting the disposition effect could alter investment performance.

We also embed our research in the vast literature on the impact of a symmetric capital gain tax (where losses can be deducted) on investor behavior. Early theoretical work by

a.o. Constantinides (1984) and Dammon and Spatt (1996) showed that capital gain taxes influence optimal investor behavior. More empirical studies find that capital gain taxes lead to higher turnover in December and January (Lakonishok and Smidt, 1986) and tax loss-selling behavior (Grinblatt and Keloharju, 2001, 2004). However, these effects are to a great extent induced by the possibility to deduct losses, which is not the case in the Belgian speculation tax. As a result, it is more important to look at the investors' behavior to realize gains. Next, in the setting of a symmetric taxation of trades, Dammon et al. (2001) report lock-in effects due to more favorable taxation when gains are not realized in the short-term. They conclude that the probability of realizing a gain in the short run drops due to capital gain taxes. As there is no change in the taxation of losses in our context, this would result in less biased behavior of retail investors due to a lower disposition effect. However, we need to be cautious with these expectations. Ivkovic et al. (2005) investigated the impact of the 1993 Omnibus Budget Reconciliation Act, a tax amendment that increased the short-term capital gain tax rate in the US. Surprisingly, they find no evidence for a lower probability of selling gains in the short run, and hence no decrease in the disposition effect. They argue that non-tax considerations may have outweighed the tax effect. Our study can give more insight in this incoherent behavior.

Although it was not the purpose of the Belgian government to lower the disposition effect. This event can be used to investigate if investors changed their behavior. Despite a vast literature (Shefrin et al., 1985; Odean, 1998; Grinblatt and Keloharju, 2001; Feng and Seasholes, 2005; Frazzini, 2006; Kaustia, 2010) on the disposition effect, knowledge on how to reduce the disposition effect is limited. Frydman and Rangel (2014) Frydman & Rangel (2014) are one of the first to succeed by making the purchase price more salient in a stock trading lab experiment. However, we analyze how this policy change reduces the disposition effect using real trading data.

2 Data

This study employs a novel dataset from a discount brokerage house active in Belgium. It holds information on the trading behavior of more than 64.000 retail investors from 2014 until 2016. To start, the dataset includes all relevant information on the trades made by the investors. Interestingly, this also contains how much taxes are paid per transaction. On average, the dataset holds 1 million stock related transactions per year. At the investor level, we have socio-demographic characteristics including age, sex, and profession, as well as the answers to a MiFID (Markets in Financial Instruments Directive, 2004/39/EC) questionnaire that tests the investors' knowledge on financial markets and products. In addition, login and logout timestamps per account provide us with the monitoring behavior of our investors.

To determine whether an investment is trading at a loss or gain, we require an unambiguous reference price. Therefore we limit our sample to sale transaction that correspond to purchases within our sample period. This results in a subsample of 20,709 clients. Descriptive statistics on the investors' demographic and stock portfolio characteristics are outlined in Table 1. Consistent with the most common dataset in the literature, investors are predominantly middle-aged males, who have been a client at the broker for an average of 6 years (see Barber and Odean (2001)). Throughout the sample period, these clients hold an average (median) of €59,933 (€19,000) on their brokerage account, of which 78% (86%) is invested in financial assets. With respect to their stock portfolios, investors hold an average (median) of 9 (6) stocks, which slightly exceeds commonly observed levels (see for instance Ivković et al. (2008). The investors trade actively for nonnegligible monetary values. The average (median) number of trades in stocks is 62 (29) with an average (median) transaction value of €4,518 (€2,348). As a result of their trading during 2016, 5,862 investors were subject to the speculation tax and paid an average (median) of €677 (€156).

3 Methodology

The goal of this study is to investigate how much the disposition effect has changed after the introduction of the speculation tax. To measure the disposition effect, we follow a similar methodological approach as in Grinblatt and Keloharju (2001) and Grinblatt et al. (2012), which was recently also applied by Kaustia (2010), Linnainmaa (2010) and Birru (2015). Each day a sale transaction takes place in a portfolio of at least two stocks, we categorize individuals' stock portfolio holdings in sale and hold decisions. We use a logistic regression model to estimate the probability that an investor sells a stock on these days. The empirical model takes the following form:

$$sale_{ijt} = \Lambda\left(\beta_0 + \beta_1\, gain_{ijt} + \mathrm{x}'_{ijt}\,\gamma\right) + \varepsilon_{ijt}. \tag{1}$$

In (1), $sale_{ijt}$ is a dummy variable that equals 1 if investor i sells stock j on day t. The indicator variable $gain_{ijt}$ is equal to 1 if the investor's capital gain since purchase on the stock was positive at the close of the prior trading day. To determine this, we use as a reference price, the volume-weighted average purchase price including transaction costs, expressed in euro. This serves as a natural benchmark for investors, because it coincides with the manner in which clients perceive their returns at the discount broker. $\Lambda(.)$ represents the cumulative density function of the standard logistic distribution. In line with the previous literature, we expect investors to trade in line with the disposition effect. This would manifest itself through a significantly positive β_1 coefficient.

Within our model we also include a long list of control variables that may influence the decision to sell a stock, in line with Grinblatt and Keloharju (2001). This allows us to properly distinguish the disposition effect from alternative investment strategies such as contrarian or momentum trading behavior. First, we control for positive and negative market-adjusted returns for each stock j over 11 non-overlapping time intervals, for the

market returns of the Eurostoxx 600 over the same periods and for their cross-products with $gain_{ijt}$ to account for a differential reaction to past market(-adjusted) returns if the position is trading at a profit in investors' portfolios. The 11 non-overlapping intervals for which we calculate returns are 0, 1, 2, 3, 4, [5 to 19], [20 to 39], [40 to 59], [60 to 119], [120 to 179], and [180 to 239] trading days before the date on which a sale transaction took place. Next, we account for potential reference price effects through two dummy variables, capturing whether the stock trades at a monthly high or low relative to the past 20 trading days. We further account for stock and market volatility by including the standard deviation of daily returns over the past 59 trading days for both the stock and the Eurostoxx 600. To account for potential calendar, industry, and life-cycle effects, we include dummies for each month, each level 6 Datastream industry classification, and each 5-year age interval in the sample. Finally, we control for the natural logarithm of the portfolio value and the holding period measured in days. To control for a possible mechanical relation of paid taxes and trading frequency, we include dummies for the number of stocks investors hold in portfolio[1], and the natural logarithm of investors' overall trading frequency.

However, it is not adequate to measure the disposition effect in 2016, and compare this to the size of the disposition effect in 2015. To make sure that the change we measure is not caused by any other external factor, we need a control group that was not subject to the tax. We use ETFs and mutual funds transactions because these trades were not subject to the tax[2]. As a result, we can compare the difference in the disposition effect between those trades subject to the tax and the control group. This difference-in-difference approach make sure we can assign this change in behavior to the introduction of the tax:

[1]We include one dummy variable for each but one portfolio size up to 50 stocks, and one dummy variable for when investors hold 50 stocks or more in portfolio.

[2]The government argued that these product are well-diversified, and therefore cannot be seen as a speculative investments.

$$
\begin{aligned}
Sale_{ijt} =& \Lambda(\beta_0 + \beta_1\, gain_{ijt} + \beta_2\, D2016 + \beta_3\, Dcontrol + \beta_4\, D2016 \cdot gain_{ijt} \\
&+ \beta_5\, D2016 \cdot Dcontrol + \beta_6\, Dcontrol \cdot gain_{ijt} \\
&+ \beta_7\, D2016 \cdot Dcontrol \cdot gain_{ijt} + \mathrm{x}'_{ijt}\,\gamma) + \varepsilon_{ijt}.
\end{aligned} \tag{2}
$$

In (2), $D2016$ corresponds to a dummy variable equal to one if the trade takes place in 2016. *Dcontrol* is a dummy variable that indicate if the trade belongs to the control group. By using a fully interacted model of $gain_{ijt}$ with both the dummy variables $D2016$ and *Dcontrol*, we allow the disposition effect to vary over time, and between the two groups. Given the nonlinear nature of our model, interpreting such interaction effects directly from model coefficients is less straightforward (Ai and Norton, 2003). Unlike in linear models, the interaction effect leads to a more complicated dependency between the disposition effect and attention. To address this, we follow the suggestion of Greene (2010) by focusing our empirical analysis on the average predicted probabilities implied by our model coefficients.

In a second step we want to investigate the effect on the performance of investors. As shown by Odean (1999), the disposition effect is bad for the performance of investors. Following his methodology of calendar time portfolios, we can examine to what extent securities bought underperform the ones sold. By doing so, we can see how much investor performance is hurt by the disposition effect. Again, we can use the difference-in-difference approach to analyze the change in returns after the introduction of the capital gain taxation, relative to trades exempt from the tax.

Since we have information on the socio-demographics, the portfolio size, the time invested (login behavior), and the financial literacy (MiFID) of investors, we allow for a heterogeneous impact of this tax introduction. As a result, we are able to investigate whether the change in the disposition effect varies across different investor types.

4 Empirical Results

4.1 Preliminary Results

Table 2 shows the results for the difference-in-difference analysis. As stated in equation (2), the model includes three-way-interactions between trading at a gain, trading in 2016, and being part of the control group (ETFs and mutual funds). In these preliminary working paper, we use the linear probability model instead of the above mentioned logistic regression model. The estimated coefficient for the $gain_{ijt}$ variable is positive, meaning that investments trading at a gain have a larger probability to be sold, providing evidence for the disposition effect. If we look at the interaction term between trading at a gain and the dummy variable for 2016, we conclude that the disposition effect dropped significantly after the introduction of the tax. In contrast, the three-way-interaction term is positive, meaning that the drop in the disposition effect for the trades in the control group was not as big compared to the trades subject to the tax.

To clarify our results, we plot the average predicted probabilities in Figure 1 We conclude that investors are disposition-prone because the probability to sell stocks trading at a gain before 2016 is 19.15%, almost twice as large as the probability of 10.17% to sell a losing stock position (Figure 1a). Furthermore, this difference of 8.98% is almost halved after 2016 (4.68%), suggesting that the introduction of the tax lowered the disposition effect significantly. However, to make sure this is not due to any external effect, we compare the change in the disposition effect between trades that where subject to the tax, and the ETF and Mutual Fund trades that were not. We notice that the drop of the disposition effect of 3.15% in the control group is lower compared to the group subject to the tax 4.30%. This means that the drop in disposition effect was larger for the trades subject to the tax. Overall, these results show that the tax induced investors to trade less in line with the disposition effect.

4.2 Future work

To start, we plan to rerun the analysis using the logistic regression model as described in section 3. Second, we notice that although ETFs and Mutual Funds were not taxed, the disposition effect dropped for these trades as well. This is possibly the result of a contagion effect because investors with a portfolio of stocks and ETFs changed their behavior for the complete portfolio, and not only with respect to taxed stock trades. Therefore, we will analyze whether the disposition effects changes more for investors that only hold stocks, compared to investors that only hold ETFs or mutual funds. We expect the results to be even stronger.

Next, as mentioned in the methodology section, it is most interesting to look at the impact on the returns of investors. We will investigate whether the lower disposition effect after the introduction of the tax translates to higher investor performance. Moreover, we can compare the change in performance to the taxes paid in 2016.

In addition, using socio-demographic and other investor characteristics seems relevant to investigate whether the change in the disposition effect and investor returns varies across different types of investors.

5 Conclusion

Our results using real trading data show that the disposition effect is lower after the introduction of a capital gain tax. The disposition effect is almost half the size after the implementation, and drops more for trades subject to the tax compared to trades that are exempt. It is important to acknowledge that fiscal policy influences trading behavior and, although not intended, can have positive externalities in the form of lower systematic investment mistakes of retail investors.

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Table 1: Descriptive statistics on investors' characteristics

	Mean	Stdev	P1	P25	P50	P75	P99
Panel A: Account information							
Male (in %)	87.81						
Individual account (in %)	76.75						
Age	49.16	14.72	22.00	37.00	49.00	60.00	82.00
MiFID test score (in %)	52.60	20.82	0.00	37.50	50.00	68.75	93.75
Number of years at broker	6.09	2.21	3.09	5.66	7.32	9.11	10.78
Panel B: Portfolio information							
Portfolio value (in €)	59,933	164,547	220	6,248	19,000	54,593	629,508
Proportion of assets (in %)	78	23	7	70	86	94	100
Proportion of cash (in %)	22	23	0	6	14	30	93
Panel C: Stock transactions							
Number of stocks in portfolio	9	12	1	3	6	11	55
Trading frequency	62	143	3	14	29	63	527
Transaction value (in €)	4,518	8,812	110	1,194	2,348	4,619	39,627
Speculation tax (in €)	677	2,378	0	40	156	494	8,247

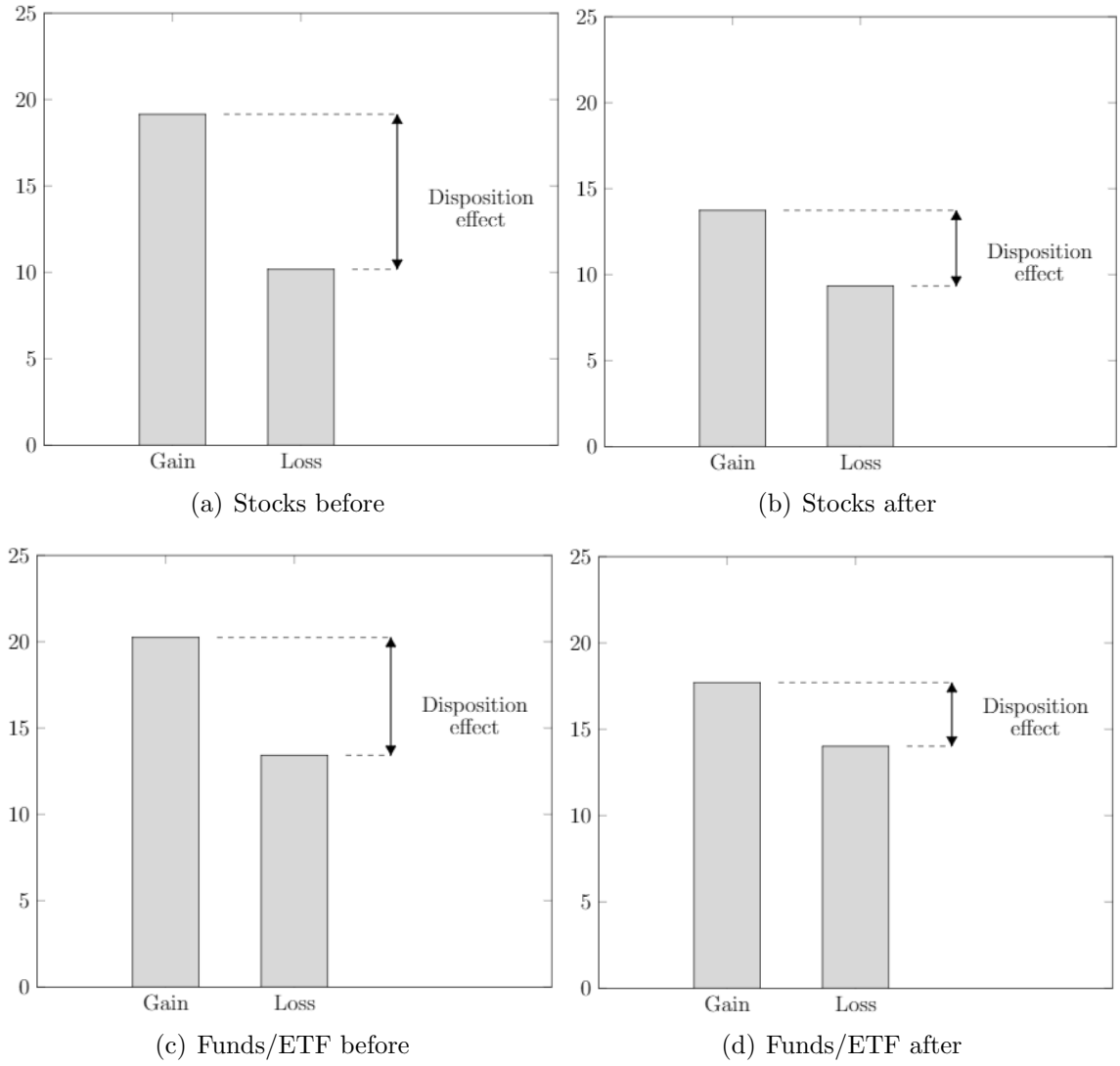
Table 1 reports descriptive statistics on clients' account characteristics (Panel A), their portfolios (Panel B) and their trading behavior in stocks (Panel C) for 20,709 clients at a large Belgian discount broker between January 2014 and December 2016. MiFID test scores are calculated on a subsample of 17,320 clients, who have completed the survey. The summary statistics in Panel B and C are calculated based upon the average across time for each client, with the exception of the number of transactions. The speculation tax is calculated on a subsample of 5,862 clients who paid any taxes during 2016.

Table 2: The disposition effect and the speculation tax

	Coefficient	t-value
Gain	0.0801***	(14.81)
D2016	-0.0084**	(-2.10)
Control	0.0324***	(2.78)
Gain × D2016	-0.0457***	(-9.67)
Gain × Control	-0.0214***	(-4.32)
D2016 × Control	0.0143***	(3.41)
Gain × D2016 × Control	0.0142**	(2.41)
Additional Controls	Yes	
R^2	13.32	
N	1,883,239	

Table 2 reports coefficients and standard errors from a linear probability model, containing three-way-interaction effects trading at a gain, trading in 2016, and if the trade was exempt from taxation. The dependent variable takes the value of one if an investor sells a stock position on a day when he sells at least some stock, and 0 if otherwise. Observations are obtained for 20,709 unique clients, who traded in common equity at the Belgian discount broker between January 2014 and December 2016. Coefficients marked with ***, **, and * indicate significance at the 1, 5, and 10 percent level, respectively. T-values are reported in parenthesis.

Figure 1: Disposition effect before and after the speculation tax



(a) Stocks before

(b) Stocks after

(c) Funds/ETF before

(d) Funds/ETF after

Figure 1 reports the predicted probabilities to sell a position trading at a gain or trading at a loss. Panel (a) and (b) show the predicted probabilities of the trades that are subject to the speculation tax before and after the introduction in 2016. Panel (c) and (d) exhibit the predicted probabilities for mutual funds and ETF, who are exempt from the tax, before and after the introduction in 2016. The predictive probabilities are obtained from 20,709 unique clients, who traded in common equity at the Belgian discount broker between January 2014 and December 2016.