

# Are French Individual Investors reluctant to realize their losses?

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## Abstract

We analyze the presence of the disposition effect for 90 244 French individual investors based on a large brokerage account database between 1999 and 2006. Main results show that French investors demonstrate a strong preference for realizing their winning stocks rather than their losing ones. However, the fiscal impact in France appears to be moderate relative to the one observed in other countries. Moreover, results indicate that the behavioral bias is not eliminated for sophisticated individual investors (higher trading activity or international diversification). Finally and more originally, based on French account specificities; we demonstrate that the change of “tax account type” does not imply any change in investors’ behavior

JEL Classification : G 10

## I-Introduction

Recent research in behavioral finance has demonstrated that investment behavior is not always consistent with the assumptions of perfect rationality generally made in the field. More precisely, this behavior has sometimes been shown to be systematically different from what is implied by normative models of standard finance theory.

One of the most widely documented behavioral biases is the disposition effect. This effect describes the tendency, at any given point in time, to more readily sell winners than losers, winners and losers referring to assets that have appreciated or depreciated since purchase. In this context, researchers have shown that investors who are prone to the bias earn poor subsequent returns on their portfolio (Odean, 1998). Of course, rational reasons can justify this behavior: portfolio rebalancing, higher trading costs of low priced assets, for instance. However, none of these reasons have been found convincing enough by researchers.

Starting with Shefrin and Statman (1985), a number of researchers among others have documented the effect: Lakonishok and Smidt (1986) on aggregate volumes, Odean (1998), Shapira and Venezia (2001), Dhar and Zhu (2006) on individual data; Weber and Camerer (1998) and Weber and Welfens (2006) bring experimental evidence.

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However, if the question of the existence of the disposition effect has been answered in some countries, no such research has yet been carried out in France.

Our paper suits the purpose by analyzing the trading records of 90 244 French individual investors at a brokerage house between 1999 and 2006. As a result, the first contribution of this study is that it is the first one on the French market and the most important in the European context<sup>3</sup>. We find that French investors demonstrate a strong preference for realizing their winning stocks rather than their losing ones. More precisely they sell a winner a little more than one and a half times faster than a loser and this behavior cannot be explained, for instance, by a desire to rebalance portfolios. However, we show that the impact of the end of fiscal year effect is clearly less important in France than in other countries.

We expect some investors to be more experienced than others; those who have higher trading activity (frequent traders) and more originally those who internationally diversify their portfolio. As a second contribution, we demonstrate that these sophisticated traders are also subject to the bias which leads us to say that experience does not eliminate the disposition effect altogether.

French specificities i.e the existence of PEA account (Plan d'Epargne en Actions) give a unique opportunity to investigate the impact of tax on the behavior of investors on the financial market. Actually, these accounts offer an interesting tax framework to their holders in the sense that capital gains are tax free if the account has been kept for more than 5 years. In this context, we study the disposition effect for holders of PEA accounts before and after 5 years. We demonstrate that individual investors do not seem to change their investment behavior according to the type of fiscal account held (PEA or traditional). This original result represents our last contribution.

The paper is structured as follows. The second section presents an overview of previous research on the disposition effect. Section III describes the data and gives some statistics on the typical French individual investor. Section IV is dedicated to the methodology and to a discussion of our main results.

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<sup>3</sup> The only European research dealing with the disposition effect on individual data concerns only 3 079 accounts (Weber and Welfens, 2006).

## II-The Disposition Effect

The disposition effect is the tendency of investors to hold losers (losing stocks) too long and sell winners (winning stocks) too soon. This phenomenon was first documented by Shefrin and Statman (1985) in a study of mutual fund performance. Subsequent papers based on market data (Lakonishok and Smidt, 1986; Ferris, Haugen and Makhija, 1988) showed that volume for winning stocks on the NYSE and the Amex exceeds that for losers. Further research on the subject will be presented in that it has to do with theoretical explanations and empirical evidence<sup>4</sup>.

From a theoretical point of view, many explanations of the disposition effect have been proposed in the literature. The most common explanation is based on the assumption of prospect theory preferences (Kahneman and Tversky, 1979, 1992) and, more precisely, on the S-shaped valuation function assumed in this model. According to this theory, investors evaluate gains and losses on their investments relative to a reference point; the buying price is the most accepted reference point. When a stock price is higher than the buying price (or more generally than the reference price), the investor is in the concave part of his valuation function and is hence risk averse. He may sell the stock if the expected return is perceived as too low. After a price drop, the investor is in the convex part and keeps the stock because he has become risk seeking. Following Shefrin and Statman (1985), a number of authors<sup>5</sup> have used this argument to justify the existence of disposition investors. In other words, when agents are risk-averse over gains and risk lovers over losses, they prefer to realize paper gains and to keep paper losses<sup>6</sup>.

A second explanation is based on an irrational belief in mean reversion, which states that investors believe poorer-performing stocks will rebound, and that better-performing stocks will decline in price. Briefly speaking, after a price increase, the investor believes that the probability of a price drop in the next period is higher than the one of another price increase (Shu et al. (2005), Weber and Camerer (1998)).

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<sup>4</sup> For experimental studies of this bias, see for example, Weber and Camerer (1998), Chui (2001), Weber and Welfens (2006) and Rubaltelli *et al.* (2005).

<sup>5</sup> For example Odean (1998) and Weber and Camerer (1998).

<sup>6</sup> Barberis and Xiong (2006) (see also Hens and Vlcek (2005)) show that the disposition effect is observed for some values of the expected stock return and the horizon of the investor, but they also find the opposite effect for other reasonable values of these parameters.

A third group of explanations argue that the disposition effect may be due to the desire to rebalance portfolios or to avoid higher transactions costs on low-priced assets. However, it has been shown in many studies that when controlling for rebalancing and share prices, the disposition effect is still observed and that the investments the investors choose to sell continue in subsequent months to outperform the losers they keep (see Odean (1998), Brown *et al* (2006), for example).

A last explanation of the disposition effect is proposed by psychologists who work on the theory of entrapment or escalation of commitment (Staw (1979), Brockner (1992)). In an investment context, the question is to know if it is better to keep a losing investment, to increase the stake (to break even), or to sell the losers and choose other stocks to invest in (Zuchel, 2001).

Finally, the disposition effect can also refer to preferences including the idea that investors seek pride and want to avoid regret when choosing investment (Shefrin and Statman (1985)). This interpretation has recently been developed by Muermann and Volkman (2006). The authors argue that loss aversion alone cannot explain the disposition effect as shown by Barberis and Xiong (2006) and Hens and Vlcek (2005) and they include the anticipation of regret and pride in a dynamic portfolio choice setting<sup>7</sup>.

From an empirical point of view, the disposition effect is now well documented on individual data. Odean (1998) was the first to study the decision process of individuals on an important database of 10 000 accounts with a total of 97 483 transactions between 1987 and 1993.

He found that the proportion of realized gains is significantly higher than the proportion of realized losses (except in December), giving evidence of a disposition effect in individual investors' behavior.

Later studies on individual data gave rise to similar results for the behavior of employees (Heath *et al.*, 1999), and for stocks in other countries than the US (Shapira and Venezia, 2001, for Israel, Grinblatt and Keloharju, 2001, for Finland, Chen *et al.*, 2004, for China, and Shu *et al.* (2005) for Taiwan, Brown, *et al.*, 2006, for Australia). The disposition effect also appears to be positive on average but of different magnitude across countries and across investors. For example, Barber *et al.* (2007) show that Taiwanese investors are much more reluctant to realize their losses than U.S investors. They interpret their findings by saying that Taiwanese traders exhibit a stronger belief in mean reversion than U.S traders.

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<sup>7</sup> For experimental evidence, see O'Curry, Fogel and Berry (2006).

Note that at an individual level, the disposition effect can vary across individual investors. Concerning this point, Dhar and Zhu (2006) confirm the presence of a significant disposition effect on average but show that one-fifth of the investors exhibit the opposite behavior and that the disposition effect is stronger for less sophisticated investors. Finally, the disposition effect is also detected in the investment decisions of professional traders. (Shapira and Venezia (2001), Genesove and Mayer (2001), and Barber *et al.* (2007), for example)<sup>8</sup>.

Next section presents the original and proprietary dataset over which we analyze the disposition effect for French investors.

### **III- Data**

The data for this study comes from a large French discount brokerage house. We obtained transaction data for all active<sup>9</sup> accounts over the period 1999-2006, that is a total of 9 619 898 transactions, with 5 074 732 buy orders and 4 545 166 sell orders, for 92 603 investors. Collected data are contained in three files: trades, investors and fees. The trades file combines the following information for each trade: ISIN code of the asset, type of asset (common stocks, bonds, certificates, warrants), buy-sell indicator, sell short indicator, date, quantity and amount in euros, place of quotation, account type (taxable versus tax-free accounts or French “PEA”), media used to place the order, order type. In the investors file, some demographical characteristics of investors are gathered: date of birth, sex, date of entry and exit in the database, date of opening and closing all the account (for each type of account), place of living, and yearly number of trades. Finally, the fees file contains monthly fees paid by each investor and indicates whether they are trade fees or short sales fees.

In order to study the disposition effect, we extracted a dataset that only includes trades for common stocks. This dataset contains 8 464 518 trades, with 4 447 678 buy orders and 4 016 840 sell orders, made by 90 244 investors over 4 377 assets. For each stock we build a file containing historical daily prices over the period 1999-2006. In this respect, securities’ ISIN codes are used to collect price data and information on splits and dividends through Fininfo<sup>10</sup>, the French data provider. At this step, some trades (less than 1%) were deleted from the dataset because, either we did not find data corresponding to the ISIN code (534 codes out

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<sup>8</sup> Coval and Shumway (2005), Frino *et al.* (2005) and Locke and Mann (2003) obtain the same kind of results on different futures markets.

<sup>9</sup>Over the period 1999-2005, active accounts are those with at least one transaction over 2 years (consecutive or not). For the last year of the sample, accounts are active if they hold at least one transaction over the entire year.

<sup>10</sup> [www.Fininfo.com](http://www.Fininfo.com)

of 4377 ones), or they constitute short sales. The final database, for which all prices are available, gathers 8 438 885 trades (4 426 894 purchases and 4 011 991 sales) for 90 079 investors.

In the context of French financial markets, two points should be outlined. First, individual investors may trade shares on a tax-free account, called PEA (Plan d'Épargne en Actions), or, as in other countries, on a traditional asset account. PEA accounts are very successful because banks mainly propose these accounts to their customers to serve as a first experience of trading on the stock market. Moreover, and more importantly for the scope of this paper, PEA accounts allow to realize tax-free capital gains if the account was opened at least 5 years ago. In our dataset, 10911 investors hold only PEA accounts and 35 598 investors hold both PEA and traditional accounts. The second point relies on the international diversification of investors' trades. Only 9,3% of trades deal with non-French shares which is not a surprising result because of the well-documented home-bias (Huberman, 2001). Figure 1 gives precisely the distribution of transactions across regions on our dataset. At the individual level, 54% of investors realize at least one trade on these “international” assets. We call them “international traders”.

### **Figure 1 around here**

We provide some preliminary statistics concerning our database. The typical investor is a man (86,42%) who trades on European assets (69.57%) and is 41.73 years old on average. Table 1 gives descriptive statistics on trading behavior of French investors. The average number of assets per trade is approximately<sup>11</sup> 460. During the period 1999-2006, investors realized more than 90 trades amounting to an average of more than 3 800€ per trade (3 696€ for buy and 4 011€ for sell). As the median trade size, number and amount are respectively 60 assets, 22 trades and roughly 2000 € we conclude that there is a considerable heterogeneity in the trading behavior of investors. On average, investors are active half of the time (4 years over the 8).

### **Table 1 around here**

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<sup>11</sup> This relatively high number of stocks per trade is mainly due to some huge trades on penny stocks.

#### IV- Methodology and results

We follow the methodology given in Odean (1998) to compute the disposition effect (for an example, see Odean (1998) p. 1782). Each day an investor sells securities, we determine whether the security is sold for a gain or a loss by comparing its selling price to its average purchase price. Therefore, each sale is counted as a realized gain ( $RG$ ) or a realized loss ( $RL$ ). Each stock in the portfolio at the beginning of each day that is not sold during that day is considered to be an unrealized (paper) gain or loss. Paper gains or losses are defined by comparing the high and low daily price of the stock to its average purchase price. If these daily prices are above its average purchase price, the trade is counted as a paper gain ( $PG$ ); in the opposite case, it is counted as a paper loss ( $PL$ ); otherwise, neither a paper gain nor a loss are counted. All gains and losses are calculated after adjusting for splits. Following Odean, we choose the reference price to be the average purchase price. The four estimates,  $RG$ ,  $RL$ ,  $PG$  and  $PL$  could obviously not be computed for portfolios containing only purchases or sales, or portfolios with only one trade or only one asset traded and for sales for which no previous purchase was identified. The final number of trades for which the preceding methodology could be applied is 8 230 826.

We use these estimates to compute the proportion of realized gains ( $PGR$ ) and the proportion of realized losses ( $PLR$ ) ratios according to the following rules:

$$PGR = \frac{N_{RG}}{N_{RG} + N_{PG}}$$
$$PLR = \frac{N_{RL}}{N_{RL} + N_{PL}}$$
$$DE = PGR - PLR$$

where  $N_{RG}$ ,  $N_{PG}$ ,  $N_{RL}$ ,  $N_{PL}$  denote the number of realized gains, the number of potential gains (paper gains), the number of realized losses and the number of potential losses (paper losses). The measure of the disposition effect is the difference  $DE = PGR - PLR$ . When this difference takes a positive value, it indicates that investors are more prone to realize gains than losses. More formally, we test the following hypothesis:

$H_0$ : *Proportion of Gains Realized*  $\leq$  *Proportion of Losses Realized*

The Z-statistic (distributed normally) is applied to test this hypothesis where:

$$Z = \frac{PGR - PLR}{\sqrt{\frac{PGR(1-PGR)}{N_{RG} + N_{PG}} + \frac{PLR(1-PLR)}{N_{RL} + N_{PL}}}}$$

In the following sections, the disposition effect is first globally studied. Then we study the presence of the disposition effect among sub-groups of traders. In the last section, we measure the impact of the tax account type on the behavior of investors.

#### IV.1 – General results

In this section, we analyze successively the disposition effect at the aggregate level, the existence of any end of year effect (tax impact) and the validity of the rebalancing assumption. Finally, we show that the disposition effect exhibits a strong variability at an individual level.

##### *- Disposition effect*

Based on 4 011 991 sales, we compute a total of 1 998 924 disposition effects for 57 153 investors<sup>12</sup>. For sake of simplicity, these investors are called “DE investors” in the rest of the paper. Here, each sale that results in a realized or paper gain/loss constitutes an independent observation. In Table 2, we give the average values of *PGR*, *PLR* and DE over those 1 998 924 independent observations.

#### **Table 2 around here**

On the entire sample, the null hypothesis ( $PGR \leq PLR$ ) is rejected with a high degree of statistical significance. French investors are prone to the disposition effect over our sample period. Note that the results differ across years.

However, looking at the evolution of the average DE and of the ratio *PGR/PLR*, we cannot highlight any distinct monotonic trend over time. For example, *PGR/PLR* values gradually increase from 2000 to 2002, peaking in 2003 and falling off as from 2004. The ratio *PGR* to *PLR* is the rate at which the individual investors prefer to sell winning stocks rather than losing ones. On the average, French investors sell winning assets a little more than one and a

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<sup>12</sup> Note that if many operations are recorded on the same day, a unique disposition effect is computed.

half times (1.68) faster than losing assets. These results are quite in line with those generally obtained in the literature: Odean (1998) and Weber and Welfens (2006) compute a ratio of 1.5 while Brown *et al.* (2006) and Chen *et al.* (2007) get 1.6.

For a better understanding of the behavior of the investors, Table 3 (column 1) gives the average returns since the day of purchase for realized and paper gains and losses for the entire sample. As noted by Odean (1998), results confirm that investors are more likely to realize smaller, rather than larger, gains and losses. Returns on paper gains are fourfold greater than those on realized gains. The same type of conclusion is obtained for losses (last two rows of table 3)

### **Table 3 around here**

#### **- Taxes**

In order to investigate whether individual investors pay attention to tax considerations at the end of the fiscal year, we also compute PGR, PLR and DE over the two intra year periods, January-November and December. Drawing on the work of Constantinides (1984), we expect investors to gradually increase their tax-loss selling from January to December. Table 4 presents the results.

### **Table 4 around here**

We test the differences in proportions over the two sub-periods. Formally, for two independent samples (1) and (2), we test the following hypothesis:

$H_0$ : *Proportion of Gains Realized in (2) = Proportion of Gains Realized in (1)*

*and*

$H'_0$ : *Proportion of Losses Realized in (2) = Proportion of Losses Realized in (1)*

The following statistic (distributed normally) is applied to test  $H_0$  where:

$$T_{H_0} = \frac{PGR_2 - PGR_1}{\sqrt{\hat{\pi}(1-\hat{\pi}) \left( \frac{1}{(N_{RG_2} + N_{PG_2})} + \frac{1}{(N_{RG_1} + N_{PG_1})} \right)}}$$

with  $\hat{\pi} = \frac{(N_{RG_2} + N_{PG_2})PGR_2 + (N_{RG_1} + N_{PG_1})PGR_1}{(N_{RG_2} + N_{PG_2}) + (N_{RG_1} + N_{PG_1})}$

$N_{RG_j}$  and  $N_{PG_j}$  denote the number of realized gains and of potential gains (paper gains) in sample  $j$ .

In table 3, the disposition effect seems to be lower in December when compared with the average value of January-November but it is still positive. Tests of differences in proportions indicate that the following results are significant:  $PGR_{Jan-Nov} > PGR_{Dec}$  and  $PLR_{Dec} > PLR_{Jan-Nov}$ . These tests show that the lower DE in December is due to an average lower  $PGR$  and a higher  $PLR$  in December. This result differs from Odean's conclusion of a lower DE in December which was due to both significantly higher  $PLR$  and  $PGR$  in December.

Moreover, looking at  $PGR/PLR$  indicates that on average, French traders realize less gains and more losses in December: the ratio of  $PGR$  over  $PLR$  being 1.57 in December against 1.68 for the entire year. However, the fiscal impact in France appears to be moderate relative to the one observed in other countries as  $PGR/PLR$  remains higher than one in December.

In previous studies, DE is generally negative and the  $PGR/PLR$  ratio is lower than 1 in the last month of the fiscal year (December in US market for Odean (1998) and June for Brown *et al.* (2006) in Australia, for example).

The results in Table 3 (column 2 and 3) also help to confirm the presence of a moderate fiscal impact at the end of the year. In December, individual investors sell losing stocks of very slightly stronger return magnitude. Returns on losing realized losses is  $-0,079$  in December against  $-0,068$  for the entire year. These results are clearly different from those computed by Odean (1998) who obtains a much greater differences between these two values ( $-0,366$  in December against  $-0,228$ ).

Finally, Figure 2 plots the average ratio of  $PGR/PLR$  obtained in our sample on a monthly basis. We notice that opposed to Constantinides' (1984) arguments, investors do not gradually decrease the rate at which they sell winning stocks compared to losing ones during the year.

**Figure 2 around here**

## **- Rebalancing**

We also test whether the disposition effect observed in our sample can be explained by the desire of individuals to rebalance their portfolios. In doing so, we eliminate in our database any sale for which the entire position in a stock has not been cleared. In fact, we do not expect an investor who is rebalancing his portfolio to sell his entire holding of an asset but only a portion of his winning stocks. 53 502 investors sold their entire position in the database. By calculating *PGR* and *PLR* for those individuals, we can see that the magnitude of the disposition effect is not reduced (table 5, column 1). Investors continue to show a strong preference for realizing winners rather than losers, suggesting that rebalancing is not a good explanation to the disposition effect. In a same vein to eliminate any transaction resulting from a desire to restore diversification, we also remove sales for which there has been a new purchase on the sale date or during the 3 following weeks (21 days). Indeed, an individual who is rebalancing is more likely to sell stocks in order to make new purchases. In column 2 of table 5, our results demonstrate that the 48 523 traders concerned still prefer to sell winners.

**Table 5 around here**

## **- Individual distribution of the disposition effect.**

An alternative way to study the tendency to hold on losers and sell winners too soon is to consider that the number of realized/paper gains and losses are independent, not at the transaction level, but at the account or investor level. Table 6 gives statistics about the magnitude of the disposition effect for 57 153 accounts.

**Table 6 around here**

This alternative test weights each account equally, which means we ignore that accounts with more trades provide more accurate estimates of their *PGR* and *PLR*. Moreover, as *PGR* and *PLR* depend on the average size of the portfolios from which they are computed, this alternative specification of the test mechanically gives higher estimates than those of Table 2. We present the distribution of DE in Figure 3. Note that a significant number of investors realize more losses than gains (ie  $PGR < PLR$ ). In fact, over our dataset, approximately 20 %

of investors do not exhibit any DE or exhibit the opposite behavior ( $DE < 0$ ). The last results confirm the ones obtained by Dhar and Zhu (2006) on American individual investors.

To get accurate insights on the aggregate level of the disposition effect, in the next section we analyze the behavior of sub groups of investors.

**Figure 3 around here**

## **IV.2 – Results over groups**

In order to investigate the influence of sophistication on the disposition effect, we constitute different groups of traders and check whether they exhibit any disposition effect. Two measures for investors skills are retained; the trading activity (based on the number of annual transactions) and the geographical diversification of trades (presence of trades outside France). Briefly speaking, we assume investors who have a higher trading activity (frequent traders)<sup>13</sup> and those who internationally diversify their portfolios to be more experienced.

Starting with trading activity, we give an ad-hoc classification of investors according to the total number of transactions realized between 1999 and 2006. We consider the 5 724 investors in the highest decile (more than 312 trades over the period) who are the most active ones and call them “frequent traders”. On aggregate, frequent traders realize 4 618 108 trades, that is more than 56% of trades. The other 51 429 traders are called “infrequent traders”. Panel I of Table 7 indicates the average PGR and PLR for frequent and infrequent traders.

**Table 7 around here**

The values of PGR and PLR for frequent and infrequent traders show that both groups are subject to the disposition effect which leads us to say that experience does not eliminate the bias altogether. Note that PGR and PLR measures are dependent on the portfolio size; we can obtain a lower disposition bias for an individual trading frequently but realizing the same number of winners/ losers. We should however point out that Dhar and Zhu (2006) compare measures of DE over sub groups. The authors justify the validity of such comparisons by saying that the portfolios’ sizes do not vary significantly from one group to another. We computed the number of stocks held by individuals in each of our sub-groups : frequent and

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<sup>13</sup> The difference could be due, for example, to a more frequent adjustment of the reference point (see, Camerer and Weber, 1998)

infrequent traders have on average respectively 78 stocks and 22 stocks. Local traders have on average 14 securities while international investors hold 33 stocks. Given the difference in portfolio sizes, we do not compare our measures of DE.

We opted for a second classification of traders in terms of experience. In fact, experience of traders may be linked to geographical diversity of their portfolio. For example, experienced traders may internationally diversify their portfolio of assets. According the ISIN of stocks, we divide “DE investors” in two categories: 41 272 among them only invest in French stocks, and we call them “local traders”, the others are “international traders”. Results in Table 7 panel II indicate that both groups are prone to the bias. More precisely, the disposition effect for “local traders” is 0.093 which is twofold the value of the disposition effect of “international traders”.

### **IV.3 – Impact of the tax account type**

In view of French specificities, we also investigate whether the fiscal account type held by individual’s influences investment behavior.

#### **- Aggregate level**

As capital gains are tax-free for PEA accounts that were kept for more than 5 consecutive years which is not the case on traditional accounts; we expect different behaviors on the two type of accounts. We first ask whether investors holding both accounts of more than 5 years old behave in the same way (relative to the disposition effect) on the two type of account.

Second, for any holder of a PEA account, 5 years represents a focal point. Therefore, in the first 5 years of the PEA, holders may act as “passive” investors, i.e. investors who mostly buy shares, for example with the help of an automatic investment plan, this service being usually offered by banks in a PEA account. Taken together these two effects may impact the DE in different ways. To serve our purpose, we focus our analysis on investors trading both on PEA and traditional accounts. On the entire sample, there are 35 598 such traders<sup>14</sup>.

We identify traders holding PEA and traditional accounts more than five years old (2 116 investors that we call “GROUP I”) and classify trades made on these accounts according to

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<sup>14</sup> Note that there are 46 094 holders of only traditional accounts and 10 911 holders of only PEA in the database.

their execution date. In other words, we distinguish trades that were realized before and those realized after the accounts reached the focal point of five years. This ensures a good comparative basis for any analysis of possible different behaviors.

Table 8 gives the results obtained for the 2 116 investors (Group I) at an aggregate level. Global results indicate that the disposition effect is clearly positive and significant before and after five years on both accounts. Accurately, on traditional accounts, the DE before five years is 0.076 (column 1) and 0.034 for trades made after five years (column 3). For PEA accounts values are 0.084 (column 2) and 0.032 (column 4).

More importantly, DE decreases between the two sub-periods whatever the account type. Therefore, tax regime differences seem not to be the unique explanation of this decrease. Actually, these results should be linked with trading experience. The impact of this variable was demonstrated in previous studies (Dhar and Zhu, 2006, Shu *et al.* 2005, Brown *et al.*, 2006 for example). Briefly speaking, as traders experience increases with time, DE decreases. Note that results for the 1665 investors trading only on PEA accounts and keeping this account for more than five years (Group II) and for the 5114 investors trading only on traditional accounts and keeping this account for more than five years (Group III) confirm the impact of experience (see appendix).

### **Table 8 around here**

#### **- Individual level**

To investigate more accurately the tax impact on behaviors, we compute the disposition effect at an individual level for the 2 116 investors belonging to Group I. The results (individual level) for these investors are given in Table 9. Table 9 confirms the decrease of the individual average disposition effect after 5 years on the two account types.

Accurately, on traditional accounts, the DE before five years is 0.159 and 0.1 for trades made after five years. For PEA accounts values are 0.179 and 0.101.

Figure 4 illustrates the overall disposition effect distribution for these investors. Note that there is still a large heterogeneity between traders after 5 years of trading experience. This first results confirms the role played by experience, but doesn't allow us to exclude any account type effect.

To test, the global impact of the change of the tax account type on these distributions, we conduct a Wilcoxon signed rank test of differences. This test uses both the information on the

direction and the relative magnitude of the differences within pairs of an identical trader average DE. For two distributions  $X$  and  $Y$ , the null hypothesis of the test is the following:  
*H<sub>0</sub>: X and Y are samples from populations with the same medians and the same continuous distributions.*

**Table 9 around here**

**Figure 4 around here**

Table 10 gives the results of the tests for the differences in distributions between type of accounts and detention duration. We denote (A) [resp. B] the distribution of the individual DE for trades over PEA before 5 years [resp. after 5 years] and (C) [resp. D] is the distribution of DE for trades on traditional account before 5 years [resp. after 5 years].  $V$  is the number of ranks of positive differences. Note that as  $N=2116$  is a large sample size, the number of the ranks of positive differences,  $V$ , is approximately normal.

The two first columns (A/B and C/D) indicate that individual distributions before and after are significantly different given account types. The behavior of investors seems to be clearly different as experience increases; this confirms the importance of learning already highlighted at an aggregate level. The test on B/D distributions allows us to reject the tax argument for the PEA account. Actually, in the period of different taxation between both accounts, no difference of trading behavior in any direction could be detected at an individual level.

**Table 10 around here**

## **V Conclusion**

This paper gives first and original results on the behavior of French investors. On a large and proprietary database provided by a French broker, we find strong evidence that the disposition effect is observed for different categories of investors and for all time periods. Moreover this mistaken behavior does not seem to be motivated by a desire to rebalance portfolios.

French investors are less prone to the disposition effect in December than during the rest of the year (due to a higher PGR and a lower PLR). Moreover, investors seem to realize losses of slightly stronger magnitude in December. However, unlike previous studies, DE is still positive (and  $PGR/PLR$  is higher than 1) in the last month of the fiscal year (Odean (1998),

Brown *et al.* (2006), for example). We demonstrate that frequent and international traders are also subject to the disposition effect. As we expect these particular traders to be more sophisticated than others, we can conclude that sophistication in terms of trading activity and geographical diversification does not eliminate the existence of the bias.

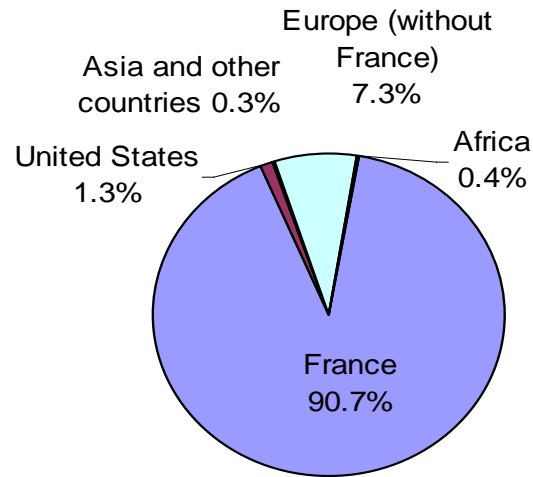
At an individual level, we find an important heterogeneity in the disposition effect and 1/5 of our traders do not exhibit any disposition effect. Finally, an analysis of a French specificity, i.e. the existence of tax free accounts (PEA more than 5 years old) allows us to confirm the positive impact of experience or learning (measured over time) as more than 5 years old accounts (whatever their type) exhibit the lowest disposition effects. Results show that any impact of change of tax regime could be detected. Finally, this first work on French individual investors should be extended at least in order to highlight characteristics of individual investors explaining the level of the disposition effect.

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**Figure 1 French individual investors trades across the world**

**Table 1 Descriptive statistics on French investors**

This table contains results based on 8 438 885 trades (4 426 894 purchases and 4 011 991 sales) for 90 079 investors over 1999-2006. “Age” (in years) is computed on the 01/01/1999, “Activity over 1999-2006” is the number of investors active accounts : active accounts are those with at least one transaction over 2 years (consecutive or not). “trade amount / investor” [resp. Total Nb of trades/investor] is the total euro amount [Nb of trades] traded by investors over 1999-2006.

Variables	Mean	Std Dev.	25%	50%	75%	99%
<b>Age</b>	41.73	14.8	30	39	52	78
<b>Assets / trade</b>	460.24	4486.10	23	60	200	7000
<b>Activity over 1999-2006</b>	4.28	2.062	3	4	6	8
<b>Trade amount/investor (€)</b>						
Buy	3696.90	9373.90	1168.18	1961.28	4450.41	24299.19
Sell	4011.24	10387.02	1203.71	2188.86	4994.84	27327.46
<b>Total Nb of trades/investor</b>	93.68	354.45	6	22	74	1099

**Table 2 The disposition effect**

This table contains results based on 4 011 991 sales over 1999-2006; 1 998 924 disposition effects are computed for 57 153 investors.  $N_{RG}$ ,  $N_{PG}$ ,  $N_{RL}$ ,  $N_{PL}$  denote the number of realized gains, the number of potential gains (paper gains), the number of realized losses and the number of potential losses (paper losses).  $PGR$  (resp.  $PLR$ ) denotes the proportion of realized gains (resp. the proportion of realized losses ratios). DE “disposition effect” is defined as  $PGR - PLR$

	Entire Sample	1999	2000	2001	2002	2003	2004	2005	2006
$N_{RG}$	2044740	270763	484745	192737	133635	199390	199570	257344	306556
$N_{PG}$	14408013	1046046	2705794	1215168	798559	1167386	1687904	2669883	3117273
$N_{RL}$	1361264	96310	309986	211637	151656	134930	147961	137532	171251
$N_{PL}$	17076433	880578	3271772	2644645	2174947	2157664	1974155	1893423	2079250
PGR	0,124	0,206	0,152	0,137	0,143	0,146	0,10	0,088	0,089
PLR	0,073	0,098	0,086	0,074	0,065	0,059	0,069	0,067	0,076
PGR / PLR	1,68	2,10	1,77	1,85	2,2	2,47	1,45	1,31	1,17
<b>DE</b>	<b>0,050</b>	<b>0,1078</b>	<b>0,065</b>	<b>0,063</b>	<b>0,078</b>	<b>0,087</b>	<b>0,036</b>	<b>0,020</b>	<b>0,013</b>
Z-stat	496,51	230,82	261,63	191,15	196,71	256,27	126,79	83,52	57,29

**Table 3 Average returns**

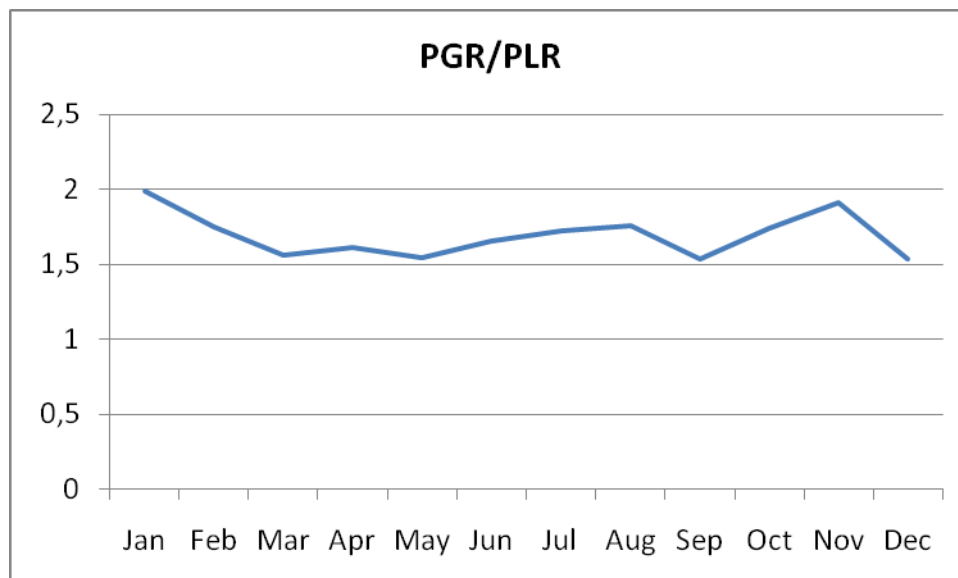
	Entire sample	Jan-Nov	Dec
<b>Return on realized gains</b>	0.1116449	0.1116082	0.1120379
<b>Return on paper gains</b>	0.4019417	0.4066277	0.3517965
<b>Return on realized losses</b>	-0.0681329	-0.0670614	-0.0795994
<b>Return on paper losses</b>	-0.2421513	-0.2424635	-0.2388105

**Table 4 DE over intra year periods**

This table contains results based on 4 011 991 sales over 1999-2006; 1 998 924 disposition effects are computed for 57 153 investors. The data are partitioned into 3 different year periods; entire year, [January-November], December. *PGR* (resp. *PLR*) denotes the proportion of realized gains (resp. the proportion of realized losses ratios). DE “disposition effect” is defined as  $PGR - PLR$ .

	<b>Entire Year</b>	<b>Jan-Nov</b>	<b>December</b>
PGR	0.124	0.125	0.124
PLR	0.073	0.073	0.079
PGR/PLR	1.68	1.71	1.57
DE	0.050	0.051	0.044
Z-stat	496.51	482.32	134.91
$T_{H_0}$ for PGR	-5.374	2.314	-0.011
$T_{H_0}$ for PLR	2.966	-28.193	-27.030

**Figure 2 Monthly level of PGR/PLR**



**Table 5 Portfolio rebalancing**

This table contains results based on 4 011 991 sales over 1999-2006; 1 998 924 disposition effects are computed for 57 153 investors. First column contains results when transactions associated to a sold of entire position are keep. Second column contains result when sales for which there has been a new purchase on the sale date or during the 3 following weeks are removed. *PGR* (resp. *PLR*) denotes the proportion of realized gains (resp. the proportion of realized losses ratios). DE “disposition effect” is defined as  $PGR - PLR$ .

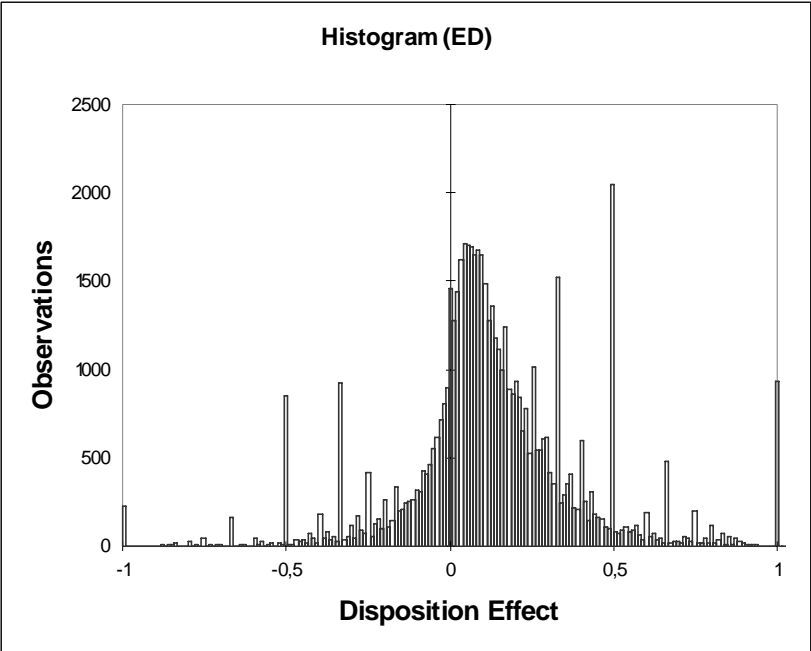
	Entire Position sold	No purchase 3 weeks after sale
PGR	0.143	0.132
PLR	0.083	0.080
PGR / PLR	1.72	1.65
<b>DE</b>	0.060	0.052
Z-stat	400.43	177.79

**Table 6 Individual level of disposition effect (independence at the account level)**

This table contains results for individual level of disposition effect for 57 153 investors over 1999-2006; *PGR* (resp. *PLR*) denotes the proportion of realized gains (resp. the proportion of realized losses ratios). DE “disposition effect” is defined as  $PGR - PLR$ .

	Mean	Standard deviation	25% centile	75% centile
<b>PGR</b>	0.286	0.212	0.142	0.375
<b>PLR</b>	0.154	0.160	0.044	0.217
<b>DE</b>	0.131	0.273	0.013	0.253

**Figure 3 Distribution of Disposition Effect for all Investors**



**Table 7 DE for groups**

This table contains results based on 4 011 991 sales over 1999-2006; 1 998 924 disposition effects are computed for 57 153 investors. “frequent” column contains results for 5 724 investors in the highest decile of trading activity (“frequent traders”). “Local” column contains results for 41 272 investors who only invest in French stocks.  $N_{RG}$ ,  $N_{PG}$ ,  $N_{RL}$ ,  $N_{PL}$  denote the number of realized gains, the number of potential gains (paper gains), the number of realized losses and the number of potential losses (paper losses).  $PGR$  (resp.  $PLR$ ) denotes the proportion of realized gains (resp. the proportion of realized losses ratios). DE “disposition effect” is defined as  $PGR - PLR$ .

	<b>Panel I</b>		<b>Panel II</b>	
	<b>Frequent (2)</b>	<b>Infrequent (1)</b>	<b>Local (2)</b>	<b>International (1)</b>
$N_{RG}$	1258594	786146	174772	1869968
$N_{PG}$	10598438	3809575	676740	13731273
$N_{RL}$	858513	502751	103683	1257581
$N_{PL}$	12210217	4866216	824921	16251512
<b>PGR</b>	0.106	0.171	0,205	0,119
<b>PLR</b>	0.065	0.093	0,111	0,071
<b>PGR / PLR</b>	1.63	1.83	1,85	1,67
<b>DE</b>	0.040	0.077	0,093	0,048
<b>Z-stat</b>	359.00	358.40	171,34	467,24

**Table 8: DE before and after 5 years for group I (Aggregate DE)**

This table contains results for investors trading simultaneously on PEA and traditional accounts and holding both accounts more than five years. Transactions are classified in two categories (realized before or after five years).  $N_{RG}$ ,  $N_{PG}$ ,  $N_{RL}$ ,  $N_{PL}$  denote the number of realized gains, the number of potential gains (paper gains), the number of realized losses and the number of potential losses (paper losses).  $PGR$  (resp.  $PLR$ ) denotes the proportion of realized gains (resp. the proportion of realized losses ratios). DE “disposition effect” is defined as  $PGR - PLR$ .

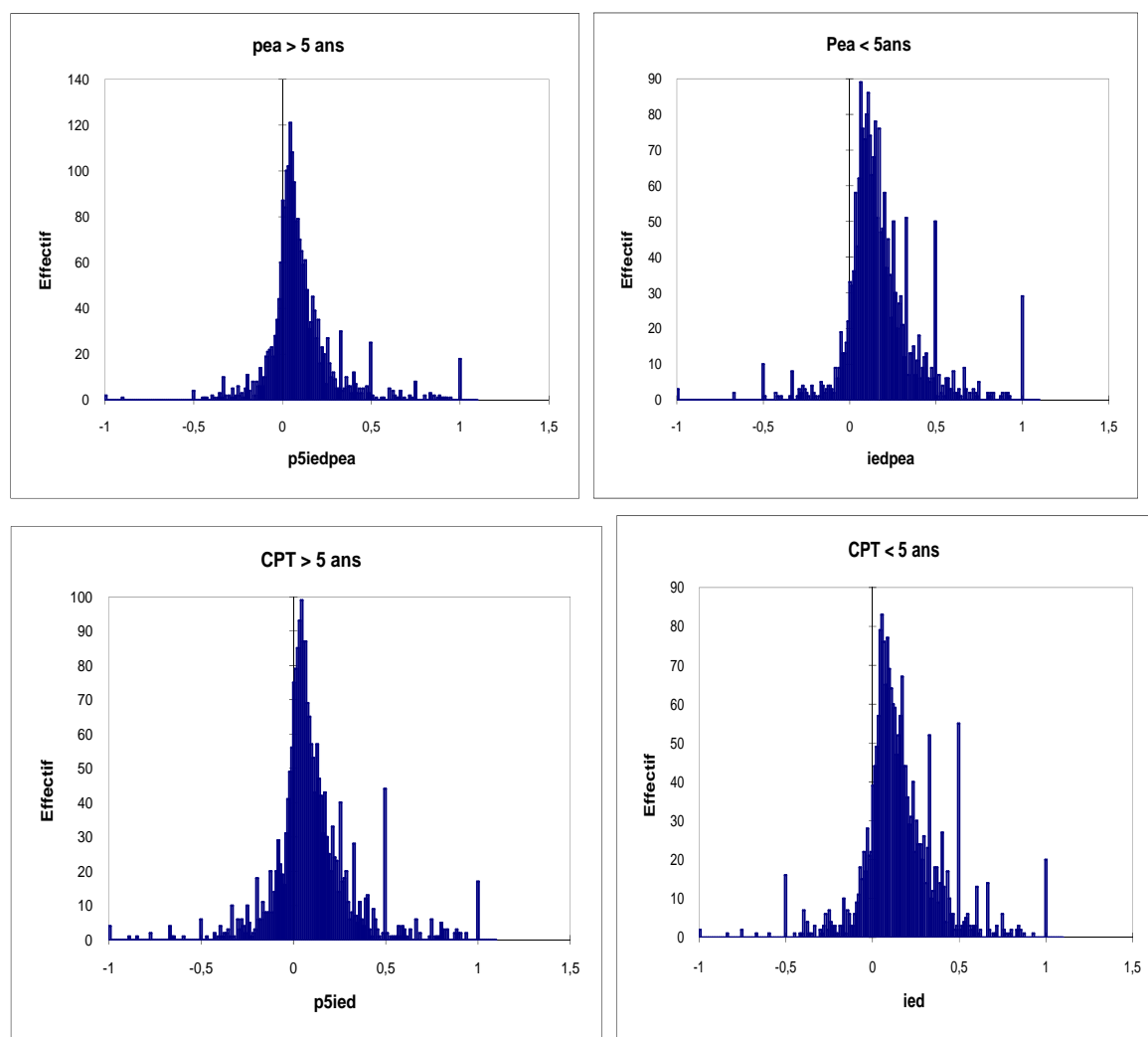
	CPT	PEA	CPT	PEA
	< 5 years	< 5 years	> 5 years	> 5 years
$N_{RG}$	79081	67015	91137	62455
$N_{PG}$	472676	419688	827693	758425
$N_{RL}$	47924	35845	59222	37382
$N_{PL}$	664230	637128	855285	816969
PGR	0.143	0.138	0.099	0.076
PLR	0.067	0.053	0.065	0.044
PGR/PLR	2.130	2.585	1.532	1.739
DE	0.076	0.084	0.034	0.032
Z-stat	136.410	149.510	85.156	88.115

**Table 9: DE at an individual level before and after 5 years for group I**

This table contains results for investors trading both on PEA and traditional accounts and holding both accounts more than five years. Transactions are classified in two categories (realized before or after five years) and DE is computed at an individual level.  $PGR$  (resp.  $PLR$ ) denotes the proportion of realized gains (resp. the proportion of realized losses ratios). DE “disposition effect” is defined as  $PGR - PLR$ .

	Numbers	Mean	Standard deviation
PEA < 5 years (A)	2116	0.179	0.211
PEA > 5 years (B)	2116	0.101	0.192
CPT < 5 years (C)	2116	0.159	0.218
CPT > 5 years (D)	2116	0.100	0.220

**Figure 4: DE distribution at an individual level for investors holding PEA and traditional accounts before and after 5 years.**



**Table 10: Wilcoxon signed rank test for the differences in distributions A, B, C and D.**

This table contains results for Wilcoxon signed rank test for investors trading on PEA and traditional accounts and holding both accounts more than five years. (A) [resp. B] denotes the distribution of individual level of DE for trades over PEA before 5 years [resp. after 5 years]. (C) [resp. D] denotes the distribution of DE for trades on traditional account before 5 years [resp. after 5 years]. V is the number of the ranks of positive differences.

	A/B	C/D	A/C	B/D
V	1680851	1465308	1228034	1117178
E(V)	1119870,5	1119882,5	1119870,5	1119891,5
Variance (V)	790084413,7	790084443	790084408,25	790084497,375
p-Value (Bilateral)	< 0,0001***	< 0,0001***	< 0,0001***	0,923
Alpha	0,05	0,05	0,05	0,923

## Appendix

**Table 11: DE for groups II and III**

This table contains results for the 1665 investors trading only on PEA accounts and keeping this account for more than five years (Group II) and for the 5114 investors trading only on traditional accounts and keeping this account for more than five years (Group III).  $N_{RG}$ ,  $N_{PG}$ ,  $N_{RL}$ ,  $N_{PL}$  denote the number of realized gains, the number of potential gains (paper gains), the number of realized losses and the number of potential losses (paper losses).  $PGR$  (resp.  $PLR$ ) denotes the proportion of realized gains (resp. the proportion of realized losses ratios). DE “disposition effect” is defined as  $PGR - PLR$ .

	Group II		Group III	
	< 5 years	> 5 years	< 5 years	> 5 years
$N_{RG}$	37845	28981	463685	170254
$N_{PG}$	183956	245240	2263150	1473797
$N_{RL}$	21182	15773	337654	121196
$N_{PL}$	266288	238359	2825800	1489822
PGR	0,170	0,105	0,170	0,103
PLR	0,073	0,062	0,106	0,075
PGR/PLR	2,32	1,70	1,603	1,375
DE	0,096	0,043	0,063	0,028
Z-stat	103,60	57,58	221,22	89,73