

THE COST OF SWITCHING:  
EVIDENCE FROM THE TURKISH PENSION FUND SYSTEM



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THE COST OF SWITCHING:  
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The Cost of Switching:  
Evidence From the Turkish Pension Fund System

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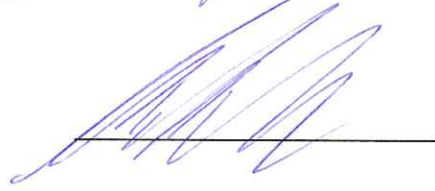
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## DECLARATION OF ORIGINALITY

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## ABSTRACT

### The Cost of Switching:

#### Evidence From the Turkish Pension Fund System

In this study, we investigate the effect of participant characteristics on trading activity and how trading activity relates to investment performance in private pension fund accounts for Turkey case. To conduct this analysis, we study 178,651 participants, their fund allocations and contribution amounts during the years 2008-2013. Descriptive summary statistics represent that there is very rare trading activity in the accounts and the trading minority trades excessively. Our regression results, consistently with the related literature, indicate that the traders are affluent, middle-aged men with higher income and education level. They also hold riskier portfolios including higher equity share. In terms of performance, traders earn 47 basis points less than non-traders on risk adjusted basis. They also have higher volatility and significantly lower Sharpe ratio indicating lower investment performance.

## ÖZET

Değişim Maliyeti:

Türk Emeklilik Sisteminden Bulgular

Bu çalışmada Türkiye'deki bireysel emeklilik sisteminde katılımcı özelliklerinin alım satım kararlarındaki etkilerini ve bu kararların yatırım performansı ile olan ilişkilerini inceledik. 178,651 katılımcının 2008-2013 yılları arasındaki fon dağılımlarını, katkı miktarlarını dikkate alarak analizi gerçekleştirdik. Özet istatistiklerimize göre alım satım aktiviteleri oldukça seyrek gözlemlenmektedir ancak ortalamanın üzerinde hareket eden bir azınlığa rastlanmaktadır. Regresyon analizlerimize göre, literatürle tutarlı olarak, bu azınlık genellikle varlıklı, orta yaşlı, eğitilmiş ve yüksek geliri olan erkeklerdir. Diğerlerine oranla hisse senedi yoğun fonlar tutarlar. Yatırım performanslarına baktığımızda ise seyrek değişim gerçekleştirenlere oranla yıllık 47 baz puan daha düşük getiri elde ederler. Aynı zamanda getirileri daha değişken ve yatırım performans ölçütü olarak aldığımız Sharpe oranları çok daha düşüktür.

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## CHAPTER 1

### INTRODUCTION

Recent years there is a worldwide trend toward defined contribution saving plans which results in delegation of responsibility to individuals. In this type of plans, individuals are responsible from their actions such as whether to participate in the plan or not, if they decide to participate how much and in which asset classes to contribute, how frequently to switch across portfolios and how to withdraw the accumulated sum once they retire (Agnew, 2010). Although this plan provides flexibility and portability, it comes with a cost: Behavioral Biases. To the contrary of the standard economic theories assuming that people are rational and have the cognitive ability to solve necessary optimization problems while deciding on their future incomes, individuals use some short cuts known as heuristics depending on the complexity and uncertainty of the situations and these short cuts eventually lead to behavioral biases.

In this paper, motivated by behavioral biases occurring during the financial decision making process, we will mainly analyze whether participant demographics can have effect on the propensity to trade or the frequency of trade in pension fund accounts. We will also investigate the relationship between annual returns of participants and frequency of trading to decide whether actively trading is beneficiary or a burden on participants. To be able to conduct this analysis, we work with a pooled cross sectional data from one of the Turkish Private Pension Fund Security companies, including information on 178,651 participants for the time period 2008-2013. We observe the monthly asset allocation of each participant and if any changes made monthly through portfolio. The data on participant characteristics such

as gender, marital status, age, income, education level, tenure in the plan, number of contract hold by participants are well defined.

We basically have three hypotheses. Firstly, whether participant characteristics affect the number of trades executed in a portfolio or the probability to be a trader. Also depending on being trader or non-trader how annual returns are affected. Our main findings are most of the participants do not trade at all in our sample and the trading minority trades excessively. The asset allocations and the weights implemented in each asset classes do not change for around 83% of the observations and 12% of observations include just one change over the entire period. The average number of trades executed is 0.30 per portfolio annually. The trading minority are generally affluent middle-aged men with higher education and income level. Besides being more inclined to be trader, they are also executing more trades in their accounts. While marital status solely does not play an important role through determining being trader or number of trades made, it induces opposite trading behavior for men and women. From return calculations it is observed that traders will earn less than non-traders on own benchmark abnormal measures. Trading minority impairs their return around 47 basis points annually. Also as education category increases from primary school to doctorate level, the annual return is decreased by 6 basis points annually. The trader participants hold more volatile portfolios with higher equity share and their Sharpe ratios indicating portfolio performance is much lower than non-traders.

Our study joins the previous literature in relating behavioral biases namely inertia bias, overconfidence bias and demonstrating cost of active investing. Research based on 401(k) accounts finds evidence on rare trading activity (Madrian & Shea, 2001; Choi, Laibson, Madrian & Metrick, 2002; Agnew, Balduzzi & Sunden, 2003;

Ameriks & Zeldes, 2004; Mitchell, Mottola, Utkus & Yamaguchi, 2006; Yamaguchi, Mitchell, Mottola & Utkus, 2007). In Agnew et al. (2003), the average annual number of trading per year is 0.26 and an individual trades every 3.85 years for the period from April 1994 to August 1998. In Mitchell et al. (2006), it is reported that only 20% of participants traded in 401(k) accounts over a two years period. Ameriks and Zeldes (2004) observes the same pattern in their paper that only 25% of the population made any trade during the entire 10 years period and the ones made more than one trade accounted for just 10% of the whole population, which are reflecting inertia bias in investment accounts. The possible reasons for inertia bias are discussed in several papers. In Madrian and Shea (2001), it is attributed to default effect. Participants may evaluate the initial allocation as suggestion of plan makers and may insist on staying on these allocations without paying any attention to possible changes that could be beneficiary. Another possible explanation is loss aversion theory (Kahneman & Tversky, 1979). Individuals weight loss relative to a reference point more than a gain relative to this reference point. Also individuals regret more if their action results in a worse outcome rather than inaction strategy (Kahneman & Tversky, 1982). So to diminish sufferings arise from their actions, they may prefer the initial allocation for the entire period of participation. While inertia bias is one extreme, another extreme is overconfidence bias in the literature. In Odean's paper (1999) it is advocated that people are prone to overestimate their abilities and knowledge. He measures the overconfidence through buy and sell decisions made in the discount brokerage accounts. According to analysis, it is indicated that the more overconfident investor, the more she trades at the cost of decreasing expected return. Gender, financial literacy, wealth and salary are found to be proxies for overconfidence (Barber & Odean, 2000, 2001; Agnew et al., 2003; Mitchell et al., 2006; Mitchell,

Todd & Bravo, 2007; Graham, Harvey & Huang, 2009). In Mitchell et al. (2006), frequently trading participants are characterized as affluent, older men with longer job tenure. These characteristics are also shown as indicators of executing any trade in pension accounts. Moreover in Chilean experience, the switchers tend to be highly educated, almost one third of the switchers have a college degree (Mitchell et al., 2007). It is explained as educational background make people feel competent than others. So feeling of proficiency makes people follow their own beliefs and eventually it leads to higher trading frequency (Graham et al., 2009).

Marriage is generally not a significant factor determining the probability of being a trader or number of trades executed in a given year. However interaction of marriage and gender is quite informative. In Barber and Odean (2001) paper, while men trade 45% more than women, being single increases it to 67% while reducing returns by 1.44 percentage points per year so marital status may play as a risk increaser or reducer role differently for female and male participants (Christiansen, Joensen & Rangvid, 2015).

Rational investors are expected to make any trade if expected returns cover the cost of it according to Grossman and Stiglitz's hypothesis (1980). However it contradicts with real life accounts. French (2008) stated in his paper that individual investors are impairing their annual returns by 67 basis points while trying to beat the U.S. stock market and get excessive returns over the period 1980-2006. Barber and Odean (2000) drew attention to annual return differences between trading investors and market, while individual investor trading frequently earns 11.4% annual return, individual investor trading infrequently earns 18.5% annual return and market returns 17.9%. From all aspects excessive trading is hazardous to the expected returns. Yamaguchi et al. (2007) attributes the decreased portfolio returns to increasing

volatility of the portfolios by trading investors in 401(k) plans. They advocate that although traders earn higher returns in non-risk adjusted basis, when we take risk into account, non-traders outperform the traders because of more volatile holdings of traders. Calvet, Campbell and Sodini (2007) relates this increased volatility to financial sophistication and knowledge. In Sweden case, they point out through estimates that though financially sophisticated investors who have higher level of wealth, income and education, tend to invest more efficiently, they also act more aggressively so welfare cost of portfolio inefficiency tends to be greater for these investors.

Our study complements and extends the literature by applying the methodology to a different and larger set of participants of defined contribution system in Turkey. The time series dimension of the data enables to track individual over time and relating their participant characteristics to trading activity. Moreover it is the first study measuring welfare cost of trading for Turkey case and it can set a good example for other developing countries.

The rest of the paper is organized as follows. Section 2 provides the brief introduction for Private Pension Fund System in Turkey, Section 3 describes the data set, Section 4 presents summary statistics for trading activity and return calculations, Section 5 illustrates the empirical findings and Section 6 concludes.

## CHAPTER 2

### THE PRIVATE PENSION FUND SYSTEM IN TURKEY

The law on Individual Pension Savings and Retirement was legislated on October 2001. However the execution of it is accomplished after some other legislations that strengthening the base of the system with the participation of six pension companies on October 2003.

Differently than previous state provided social security system, the new system is based on voluntary participation and the defined contribution principle. Individuals can register into the system by signing an agreement with a pension company. Then suggesting a plan appropriate for participant's future expectations, current income level and age becomes company's responsibility. Participants can modify payment periods and contribution amounts flexibly. They can change the fund allocations at most six times and pension plans at most four times annually. There is no limit on number of contracts hold, however during retirement date, participants need to unite their all contracts. The retirement age limit is 56 and a participant should stay in the pension plan at least for ten years to be able to get retirement benefits. Participants can also change their pension fund companies after a period of two years.

Private pension fund system is seen as one of the solution to structural problem of low domestic saving rates of Turkish economy thus encouraged by state starting from January 2013. The total amount of state contribution in 2015 is 5 billion Turkish Liras, which increased around 66% with respect to previous year. The number of participants reached to 6 million with 20% growth rate and total amount of assets invested reached to 47.5 billion Turkish Liras experiencing around 25% growth rate as of 2015. According the data, the support seems efficient however still our private



pension fund assets to GDP ratio is 5.5%, which is far below the OECD average 84.4% in 2014.

There exist three different types of contracts: individual pension contracts, group individual contracts and non-contributory group contracts. The main difference of first two contracts from latter is practicing the rights owned by contract. In non-contributory group contracts, the central entity is responsible for making necessary changes on behalf of the participant, whereas in former ones participants take all necessary actions. The shares respectively for three types of contracts are 72.2%, 21.1% and 6.7% and their asset shares are respectively 73.7%, 22.2% and 4.1% in 2015.

Majority of participants in the system corresponding 77.8% hold just one contract, 15.5% of participants hold two contracts and the remaining holds at least three contracts. On average 40% of the participants are female and 60% are male, mean of their age is 45.2.

## CHAPTER 3

### DATA

The data in our study come from a private pension fund security company in Turkey. The dataset includes information on 178,651 participants for the time period of 2008-2013. The original data includes more participants however we have eliminated some observations whose gender, marital status, age, income, education or year variables are missing and also eliminated the participants who were in the plan for less than one full year. The participant characteristics are well defined through data. Beside participant characteristics, we can also track individuals' contract and fund selections, amount of contribution and allocation details monthly.

#### 3.1 Participant characteristics

Descriptive statistics for the participants are presented in Table 1. The male participants are more than female participants, which is quite close to Turkey average of 60% and 40% respectively in 2015. Around 71% of the participants are married, also most of them are male with a ratio of 43%. Our sample is relatively younger than Turkey average with mean of 38.58 years old. Education is separated into four categories in our study. As it is represented in the table, majority of the population graduated from University, High School graduates follow it. Master and PhD level graduates are just a small fraction. Average level of income is around 3443 Turkish Liras. Most of the participants in the sample, about 72%, take part in low wealth category, and the remaining majority is in high category with 21%. Participants' entry years are also observable in the data. Since the system started in 2003, it alters between 1 and 11.

Table 1. Descriptive Participant Statistics

	Observations	Percent	Mean	Standard Deviation
Gender				
Male	103,024	57.67		
Female	75,627	42.33		
Marital Status				
Married	126,198	70.64		
Single	52,453	29.36		
Married and Male	76,040	42.56		
Education				
Primary School	29,081	16.28		
High School	62,297	34.87		
University	76,086	42.59		
MA & PhD	11,187	6.26		
Income	178,651		3442.762	2742.84
Age	178,651		38.58	9.11
Wealth				
Low	128,924	72.17		
Medium	13,185	7.38		
High	36,542	20.45		
Tenure	172,992		5.11	2.43
Number of Contracts	172,085		1.19	0.54

*Notes:* The table describes general statistics concerning the plan participants at least one year registered between the periods 2008-2013.

### 3.2 Investment choices

There exist 21 different types of investment funds in the plan as of 2013. However, number of funds is changing from year to year. In 2008, there are only 11 available funds. As system is improving and necessitates more alternatives, the company increases number of funds. In 2009-2010 it reaches to 12 alternatives and 2011-2012 it became 16 available funds. In 2013, state increased its support to private pension funds by contributing extra 25% to the annual total contribution amount. If a

participant contributed 1000 Turkish Liras at the end of the year to her pension account by state contribution it becomes 1250 Turkish Liras. We eliminated these two state contribution funds during the analysis, because they result in overestimation of number of switching. Elimination does not affect overall analysis though, because selection of these funds are independent of participant's switching behavior and they follow the same pattern across participants as they contribute regularly.

Participants are prone to hold generally one or two funds in their accounts. Especially the increase in number of available funds through years results in increase in the mean number of funds held by participants annually. Holding one fund was corresponding approximately 80% of the observations in 2008 however it deteriorates to 50% of observations in 2013.

In our private pension fund system there is no limit on number of contracts to hold. But consistently with Pension Monitoring Center analysis, in our sample majority holds one contract. 86% of participants hold one contract, 11% hold two contracts and the remaining minority holds three or more contracts.

In Turkish pension fund system, the participants can select plans not funds. The fraction of each fund in selected plan is fixed so participants can't directly decide on equity share of their funds. Thus equity holdings are very low in Turkey compared to other countries. Approximately 60% of equity allocations among observations are zero. Table 2 represents overall average allocation to equities is 9.06 percent with a standard deviation of 15 percent, which is quite low according to Iyengar and Kamenica (2010) with 78% and Agnew et al. (2003) with 40.5% both representing U.S data. However the equity allocations follow a positive trend through years, average annual equity allocation increases to 13.12 percent in 2013, which may be

attributed to increase in number of funds involving equity. The investment graphs are shown in Figure 4, 5 and 6 (see Appendix).

Table 2. Descriptive Statistics for Equity Share

	Observations	Mean	Standard Deviation
All	403,323	0.0906	0.1499
Year			
2008	11,378	0.059	0.1277
2009	31,107	0.0447	0.1162
2010	53,874	0.0412	0.1103
2011	69,416	0.0707	0.1485
2012	99,160	0.0927	0.1529
2013	138,388	0.1312	0.1589
Gender			
Male	228,722	0.0965	0.1566
Female	174,601	0.083	
Marital Status			
Married	290,478	0.0888	0.1486
Single	112,845	0.0951	0.1533

*Notes:* This table reports the statistics for the average annual equity share in participant portfolios. For a given year and a participant, annual average is calculated only if the participant made a contribution in all of the 12 months of that year.

## CHAPTER 4

### TRADING AND RETURN CALCULATIONS: SUMMARY STATISTICS

#### 4.1 Trading activity

For trading measures and return calculations we follow 178,651 participants between 2008-2013 and gather 403,323 observations. Trading activity is observed monthly and summed up per year for each participant. In our calculations to be evaluated as trade, participants do one of the following three changes: Changing number of funds, changing selection of funds or changing weight allocated to each fund at least for 5 percentage points with respect to previous month. In Figure 1, it is observed that about 83% of annual number of trades is zero, approximately 12% of the all observations are involving just one trade per year, remaining 5% of observations are for two or more trades up to 11 per year. These statistics indicate that trading is not

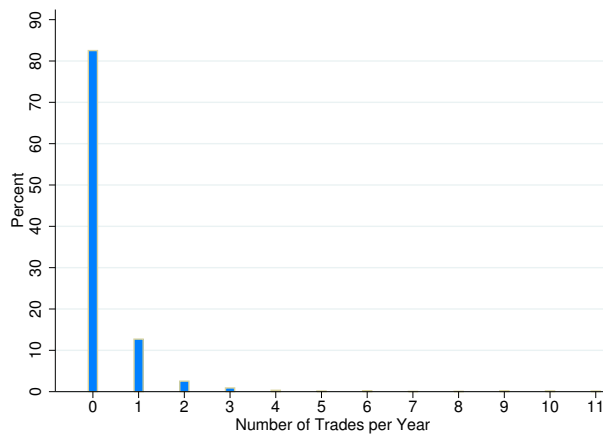


Figure 1. Distribution of number of trades.

*Notes:* Trade implies any possible change including changing number of funds, changing selection of funds or changing weight allocated to each fund at least for 5 percentage points with respect to previous month. Number of trades are calculated annually per portfolio. The beginning of year benchmark to measure number of trade is January for all years, as month passes the benchmark adjusts to previous month.

frequent among participants. Consistently with literature, our data suffers from inertia bias.

Since 83% of the observations do not trade at all, it is valid to investigate the distribution of overall observations across traders and non-traders, to be able to interpret the likelihood of trading activity across participant characteristics. As seen from Table 3, while 57% of whole observations are men, among traders the share increases and reaches to 61% and male share among non-traders is 56% and the mean difference between the two group is significant.

Table 3. Descriptive Plan Statistics for Traders and Non-Traders

	Whole Sample	Traders	Non-traders
All Observations	403,323	70,488	332,835
Percentage		0.17	0.83
Gender			
Male	0.57	0.61***	0.56
Marital Status			
Married	0.72	0.72	0.72
Education			
High School	0.33	0.28***	0.34
University	0.45	0.51***	0.43
MA & PhD	0.07	0.10***	0.07
Income	3633.023	4005.433***	3554.154
Wealth			
Medium	0.07	0.08***	0.07
High	0.23	0.27***	0.22
Age	39.31	39.65***	39.24
Tenure	5.90	6.05***	5.86
Number of Contracts	1.16	1.19***	1.15

*Notes:* The table represents mean number of observations for participant characteristics across trader and non-trader participants. (\*\*\*) , (\*\*) and (\*) indicate mean difference significance at 0.01, 0.05 and 0.1, respectively.

Applying the same analysis to marital status does not lead to any significant effect, the mean share of married observations are almost equal among traders and non-traders.

Among traders, higher levels of education are more likely to appear and lower levels are much less with respect to whole observations. The share of MA and PhD graduates among traders is 10% on average, whereas it is 7% among non-traders. Same argument is valid for high school graduates. The whole share of high school graduates is 33% but it is 28% among traders and 34% for non-traders. As education level increases, people are significantly more likely to be traders.

Overall average of income is 3,633 Turkish Liras however this average increases for traders sample to 4,005 Turkish Liras and decreases for non-traders. Again it is significant that participants earning higher income are more likely to be traders. Also wealthier investors are significantly prone to be traders.

The interesting part in this study is to investigate how participant characteristics affect trade frequency. The table 4 represents the mean trade per year for different participant characteristics. Average mean number of trade is 0.30 with a standard deviation 0.98, however it changes across years.

Male participants trade significantly 19% more than their female counterparts with 0.32 annual mean number of trade for male and 0.27 for female participants. The mean difference between married and single counterparts is also significant at 5% significance level but it is quite negligible around 3%.

Education effect is consistent across categories, as level of education increases mean number of trade increases steadily and significantly. According to summary statistics, while base level is primary school graduates, high school graduates 14%, university graduates 59% and MA & PhD level graduates 86% trade more than base



Table 4. Number of Trades Statistics

Statistics by Group			
	Observations	Mean	Standard Deviation
All	403,323	0.30	0.98
Year			
2008	11,378	0.28	0.86
2009	31,107	0.34***	1.08
2010	53,874	0.26**	0.86
2011	69,416	0.38***	1.25
2012	99,160	0.23***	0.79
2013	138,388	0.31***	0.96
Gender			
Male	228,722	0.32	0.98
Female	174,601	0.27***	0.97
Marital Status			
Married	290,478	0.30	0.99
Single	112,845	0.29***	0.95
Education			
Primary School	61,350	0.22	0.86
High School	131,972	0.25***	0.88
University	180,179	0.35***	1.04
MA & PhD	29,822	0.41***	1.16
Income			
Under 18,000	88,742	0.24	0.86
18,001-30,000	95,407	0.25	0.85
30,001-60,000	120,049	0.31***	1.01
60,001-120,000	84,844	0.38***	1.13
120,000+	14,281	0.40***	1.1
Wealth			
Low	280,840	0.28	0.94
Medium	29,876	0.31***	0.98
High	92,607	0.36***	1.08
Age			
Under 35	155,745	0.27	0.89
36-45	147,867	0.31***	1.00
46-55	78,985	0.33***	1.06
56-65	18,690	0.32***	1.08
65+	2,036	0.31***	1.14
Tenure			
Under 3 years	70,637	0.23	0.61
4-7 years	214,790	0.28***	1.00
7+ years	108,936	0.37***	1.12
Unknown	8,960	0.32	0.88
Number of Contracts			
1 Contract	341,279	0.29	0.97
2 Contracts	36,686	0.34***	1.02
3+ Contracts	9,736	0.40***	1.07
Unknown	15,622	0.28	0.93

Notes: The table presents statistics on annual number of trades. For each group sorting, we test the null hypotheses that the mean of each subcategory equals the mean of the reference subcategory. (\*\*\*), (\*\*), and (\*) indicate significance at 0.01, 0.05 and 0.1, respectively.

level of education. It can be attributed to overconfidence bias that, as participants have higher level of education, they act more overconfidently and aggressively in their actions resulting in increase mean number of trade.

It can also be observed from income level statistics. As income level increases, mean number of trading increases. Higher income level participants trade 67% more trade than lower income level participants with mean of trades respectively 0.40 and 0.24 per year. Same pattern is observed in wealth level, as wealth level increases mean number of trade per year increases significantly. In literature, wealth, income level and education are described as best proxies to measure overconfidence bias. Thus depending on summary statistics, our sample seems exposed to overconfidence bias.

Number of trade increases with age to some extent, it follows a hump shaped pattern, it increases till 46-55 years old to mean 0.33 however it starts to decline starting from that level. It is explained in literature that as investors age they are more likely to invest in safer and guarantee assets thus more number of trading is unlikely.

As expected, increase in number of contracts leads to increase in mean number of trades. Since we conduct the analysis on participant level, if an investor trades in any of her contracts, we count this change as trade for this month. While investors own one contract trade on average 0.29 per year, the investors having three or more contracts trade 0.40 times per year which is 38% higher than one contract holders.

Moreover as participants have longer tenure in plan, they are inclined to have more number of trades. New participants whose tenure is below 3 years in the plan trade with annual mean of 0.23, while older participants whose tenure is above 7 years in the plan trade 0.37 on average per year. It can be explained through learned experience by extra year in the plan and feeling competent results in higher number of trading.

## 4.2 Return calculations

The second question we try to answer is whether participants are gaining higher returns by trading more or they experience better investment performance. Since annual mean number of trade is zero for 83% of observations, and we have limited observations for number of trades exceeding two, we separate participants as traders and non-traders depending on if any trade is executed per year.

Table 5 is better to demonstrate the annual return, volatility and Sharpe ratio measures across traders, non-traders and overall observations. While return gained is lower for traders, annual volatility is significantly higher. Investor performance is

Table 5. Investment Performance Indicators Statistics

	Observations	Investment Performance Indicators	Mean	Standard Deviation
All	403,323	Return	0.06	0.08
		Volatility	0.04	0.03
		Sharpe Ratio	4.45	5.43
Trader	70,488	Return	0.05***	0.09
		Volatility	0.05***	0.04
		Sharpe Ratio	3.16***	4.31
Nontrader	332,835	Return	0.07	0.08
		Volatility	0.03	0.03
		Sharpe Ratio	4.72	5.61

*Notes:* The table represents mean values for investment performance indicators across trader and non-trader participants. (\*\*\*) , (\*\*) and (\*) indicate mean difference significance at 0.01, 0.05 and 0.1, respectively.

affected gradually because of trading. According to statistics, non-traders experience 49% higher investment performance than traders with a Sharpe ratio 4.72 for non-traders and 3.16 for traders.

## CHAPTER 5

### EMPIRICAL FINDINGS

In this section, through empirical analysis we first try to explore the role of participant characteristics on trading activity then investigating effect of trading activity on investor performance. To be able to make this analysis, we work with some time-invariant variables such as gender, marital status, education, income, contract number, wealth categories and some time-variant variables such as age, tenure in the plan.

First analysis explores how participant characteristics affect propensity to be trader. Since most of the observations' trading number is zero, we will demonstrate which participant characteristics relate to being trader or non-trader. Dependent variable is trader, which implies participant's executing any trade in the entire year or not, where independent variables are participant characteristics. Since our dependent variable is 0/1 variable, we estimate through Probit model.

The first column of regression results in Table 6 indicates that when the investor is male the probability of being trader rises by 2.01 percentage points. Marital status is insignificant.

Education increases the probability of being trader significantly. High school graduates are 2.33 percentage points more likely to be traders than primary school graduates whereas master and doctorate level graduates' probability to be trader is 7.34 percentage points higher than primary school graduates. Thus it steadily increases with increasing education category. Income is significant and increases the likelihood of being trader by 1 percentage points. Age is significant but has very small effect.

Table 6. Pooled Cross-Sectional Regressions of Probability of Being Trader, Number of Trades and Return

Dependent Variable	Trader	Number of Trades	Return
Year			
2009	0.0211***	0.2763***	-0.0032***
2010	0.0126***	-0.0066	-0.0024***
2011	0.0372***	0.6322***	-0.0055***
2012	0.0050	-0.0901*	-0.0017***
2013	0.0631***	0.1888***	-0.0053***
Gender	0.0201***	0.2055***	0.00002
Marital Status	0.0026	0.0370	0.00007
Education			
High School	0.0233***	0.0686**	-0.0003***
University	0.0596***	0.2417***	-0.0005***
MA&PhD	0.0734***	0.2855***	-0.0006***
Income	0.01***	0.06***	3.84E-05
Wealth			
Medium	0.0146***	0.0390	0.0002
High	0.0258***	0.0923***	-0.00006
Age	0.0007***	0.0186**	-0.00001**
Tenure	0.0037***	0.0804***	0.00003
Contract Number	0.0154***	0.0187	-0.0002***
Trader			-0.0047***

Notes: The first column of table presents results from Probit estimation. Trader dependent variable indicates if the participant trades at least once during the entire year or not. Marginal effects of the variables are reported. The second column presents results from Zero Inflated Negative Binomial estimation. Incident rate ratios are reported. The last column of table presents results from OLS estimation. Return indicates own benchmark abnormal returns. In all regressions, standard errors are clustered at the participant level. (\*\*\*), (\*\*) and (\*) indicate significance at 0.01, 0.05 and 0.1, respectively.

Extra one year tenure in the plan results in 0.37 percentage points increase in probability and one extra contract increases the probability to trade by 1.54 percentage points.

While marital status effect is insignificant, the interaction of gender and marital status is significant and the effect changes for male and female, which is indicated in the first column of Table 7.

Table 7. Marginal Effects for Interaction of Gender and Marital Status

	Trader	Number of Trade	Return
Single Men vs. Single Women	0.0460***	0.2055***	-0.00014***
Married Men vs. Married Women	0.0112***	0.0820***	0.00007***
Single Men vs. Married Men	0.0127***	0.0742***	-0.00016***
Married Women vs. Single Women	0.0220***	0.0375***	-0.00006***

Notes: See Table 6. (\*\*\*) , (\*\*) and (\*) indicate significance at 0.01, 0.05 and 0.1, respectively.

While single men is likely to be trader with 4.60 percentage points higher than a single women, the difference between men and women decreases when they are married thus married male is likely to be trader 1.12 percentage points higher than his married female counterparts.

In the second column of Table 6, where number of trades is dependent variable and participant characteristics are independent variables, we will investigate how participant characteristics relate the number of trading activity. As majority of the trade observations is zero and dependent variable, number of trades, is a count variable, we implement zero inflated negative binomial regression model. In this model, two separate models are employed. First a Logit model is generated for certain zero cases whether or not a participant would be in this group, then negative binomial count model is generated for who are not certain zeros. Finally these two models are combined. This model is useful in count models including excessive zero observations to prevent over-dispersion in the analysis.

The regression analysis shows a random pattern over the years, consistently with summary statistics. In 2011 the number of trading increases by 63% with respect to the base year 2008. The increase in trading activity is also observed in 2009 with 28% and in 2013 with 19%.

Male participants trade around 21% more than female significantly. Marital status effect is insignificant and even if it had effect it would be quite small around 4%, which is again consistent with the summary statistics. However the marital status is marginally significant while explaining the difference in trading activity between men and women. The result is presented in second column of Table 7. Single men trade around 21% more than single female participants however the difference between men and women decrease to 8% when they get married. While single men trade around 7% more than their married counterparts, the situation reverses for female case, married women trade 4% more than single ones. As consistent with the literature, marriage plays a risk inducer role for male whereas it is risk increaser for female.

Education significantly increases the number of trading and it has positive trend among categories, as illustrated in Figure 2.

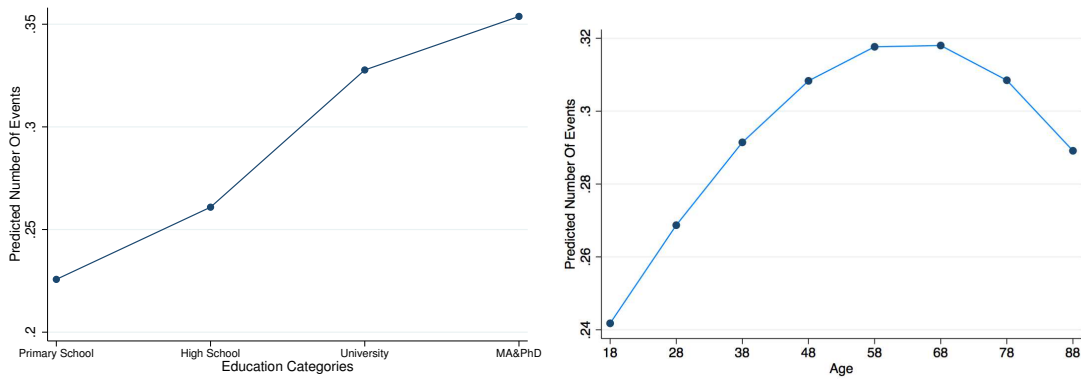


Figure 2. Predictive margins of education categories and age for number of trades.

Notes: Predictive margins are attained from Zero Inflated Negative Binomial Regression to estimate number of trades.

High school graduates trade 7% more than primary school graduates and the difference even gets bigger as education level increases. It reaches to 24% for university graduates and approximately 29% for MA&PhD levels.

Age effect significantly increases number of trades by 1.8% with a year increase in age. However it is not linear over age groups, which is observed in the right graph of Figure 2. While it increases rapidly for middle age group starts to decrease as getting closer to retirement. So mid-aged participants are marginally trading more with respect to younger and older participants in the sample.

Income has also positive and significant effect. 1000 Turkish Liras increase in monthly income results in 6% increase in number of trading. However just as age, income also experience non-linearity between income levels. While the effect is modest for lower income category it becomes larger for middle-high income earners. Contrary to the income effect, wealth effect is insignificant except highest wealth category. Wealth has significant effect on number of trading just for the high wealth level category around 9% with respect to base category.

The number of years spent in plan increases the number of trading by 8% and it steadily increases as years spent increasing. However contract number hold by participants is insignificant to make any comment on number of trading activity. Even if it had any effect it would be quite small with about 2%.

The third column in Table 6 illustrates the annual return estimates for different participant characteristics, and trader participants. Trader independent variable stands for the participants trading at least once during the entire year. Since majority of the population do not trade at all, it is valid to use such variable to measure the cost of investing depending on trading behavior. We run a OLS model where the dependent



variable is annual returns from each single portfolio and independent variables are participant characteristics and being trader or not.

While calculating return, we use own benchmark abnormal return measure. In this calculation, the benchmark return is investor's beginning of year portfolio and we also calculate the end of year return if any changes made in portfolio during the year. The abnormal return represents the difference between return earned by investor at the end of the year and investor's beginning of year portfolio return. The advantage of this calculation is that it provides self-selected risk adjusting method for each participant. Findings indicate that trader investors earn 47 basis points less than non-traders on risk-adjusted basis. Also while participant characteristics are generally insignificant, education category and age variables are significant. Figure 3 illustrates that return earned decreases significantly as education level improves. Age has also significant and negative effect on annual returns. However the effect is bigger for middle aged participants and starts to decrease after 58 years old.

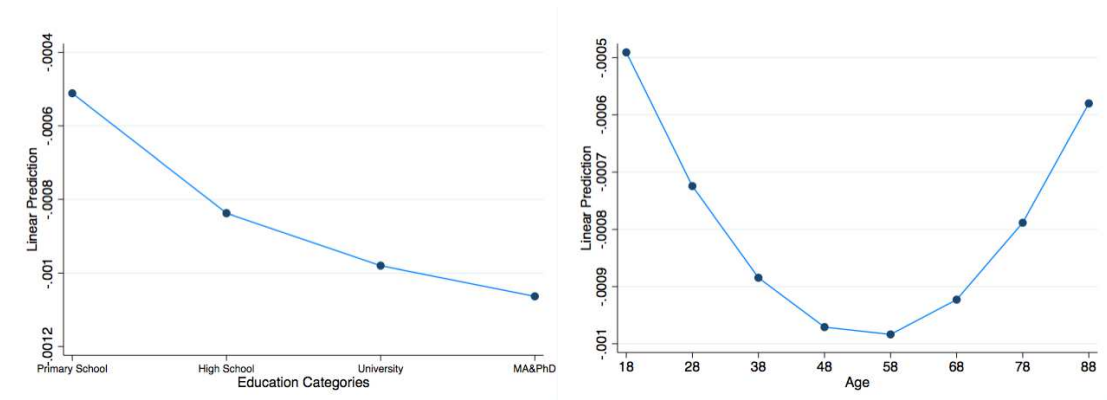


Figure 3. Predictive margins of education categories and age for return.

Notes: Predictive margins are attained from OLS Regression to estimate own benchmark abnormal returns.

For both variables, Figure 3 follows exactly the opposite trend from the Figure 2. So as number of trading increases, the expected return decreases. Participants are trading at the cost of decreasing their expected returns.

To have better understanding of investment performance, we also analyze the volatility and Sharpe ratio of participants depending on being trader or not, and controlling for overall participant characteristics. The first column of Table 8 demonstrates that as explained in literature the traders are observing higher volatility.

Table 8. Pooled Cross-Sectional Regressions of Volatility, Sharpe Ratio and Equity Share

Dependent Variable	Volatility	Sharpe Ratio	Equity Share
Year			
2009	-0.0214***	4.2966***	-0.0696
2010	-0.0335***	3.7434***	-0.0982
2011	-0.0228***	-2.3575***	-0.0188
2012	-0.0263***	3.1829***	0.0544
2013	0.0063***	-4.6177***	0.1138
Gender	0.0023***	-0.0691***	0.0114***
Marital Status	0.0001	0.0091	0.0005
Education			
High School	0.0016***	-0.0424	0.0273***
University	0.0050***	-0.0462	0.0664***
MA&PhD	0.0074***	-0.2820***	0.0972***
Income	-6.36E-04***	-0.1011	-2.69E-03***
Wealth			
Medium	-0.0001	-0.0077	-0.0011
High	0.0010***	-0.1290***	0.0187***
Age	-4.96E-06	-0.0093***	0.0007***
Tenure	-0.0016***	0.0550***	-0.0287***
Contract Number	0.0018***	-0.0826***	0.0332***
Trader	0.0114***	-1.1081***	0.1570***

Notes: The first and second column of table presents results from OLS estimations. The last column of table presents results from Tobit estimation. In all regressions, standard errors are clustered at the participant level. (\*\*\*), (\*\*), and (\*) indicate significance at 0.01, 0.05 and 0.1, respectively. Marginal effects of the variables are reported.

Almost all variables increasing number of trading also increases the annual volatility. However spending more years in the plan decreases the annual volatility. Also the second column of Table 8 represents that the Sharpe ratio indicating investor performance of participants is getting worse when investor is a trader. Traders' annual investment performance is around 1.11 points less than non-traders. In this regression, education level is insignificant except highest category. Gender, age, number of contracts are both significant and have decreasing effect on the Sharpe ratio. Additionally we investigate how participant characteristics or being trader affect participant holdings. We run a Tobit regression where dependent variable is equity share of portfolios and independent variables are participant characteristics and being trader. Estimation results in Table 8 indicate that traders tend to hold more riskier shares than non-traders. Consistently with previous findings, female participants are more conservative, older investors are likely to hold more risky portfolios, and educated people are prone to hold more stock than their less-educated counterparts.

## CHAPTER 6

### CONCLUSION

In this paper, we studied the trading behavior and cost of investing depending on trading pattern for large group of private pension fund participants between years 2008-2013. Our main goal was investigating the participant characteristics effect on probability of being trader and frequency of trade and if the investor is a trader calculating its performance through return, volatility and Sharpe ratio measures.

Majority of the observations suffer from inertia bias and 83% of annual number of trades is zero. Another observed extreme is overconfidence bias, consistently with literature, education level, gender, income, wealth, age are good proxies for overconfidence bias in our sample. Affluent middle-aged men with higher income and education level tend to be trader and they also tend to trade more frequently.

While being married or not does have not any significant effect on trading behavior, the interaction of gender and marital status is significant and quite informative. While being single is increasing number of trading and tendency to be trader for male participants, being married affects the female participants in the same way. So being married is a risk reducer condition for male participants.

Trader participants are trading at the cost of decreasing their annual returns. The regression analysis indicates that traders earn 47 basis points less than non-traders. Also annual portfolio volatility of trading investor is higher with increasing share of equity. Sharpe ratio of traders, indicating overall portfolio performance, is significantly lower than non-traders.

APPENDIX

INVESTMENT CHOICES IN DETAIL

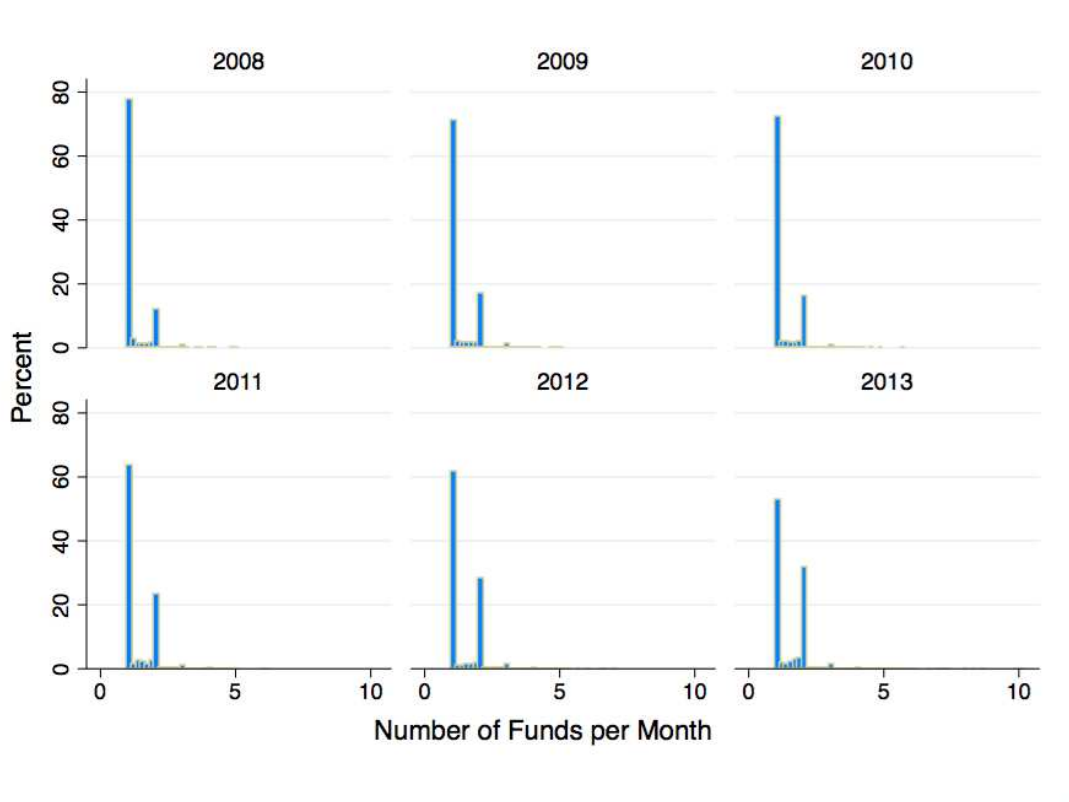


Figure 4. Average number of funds per month for the years 2008-2013.

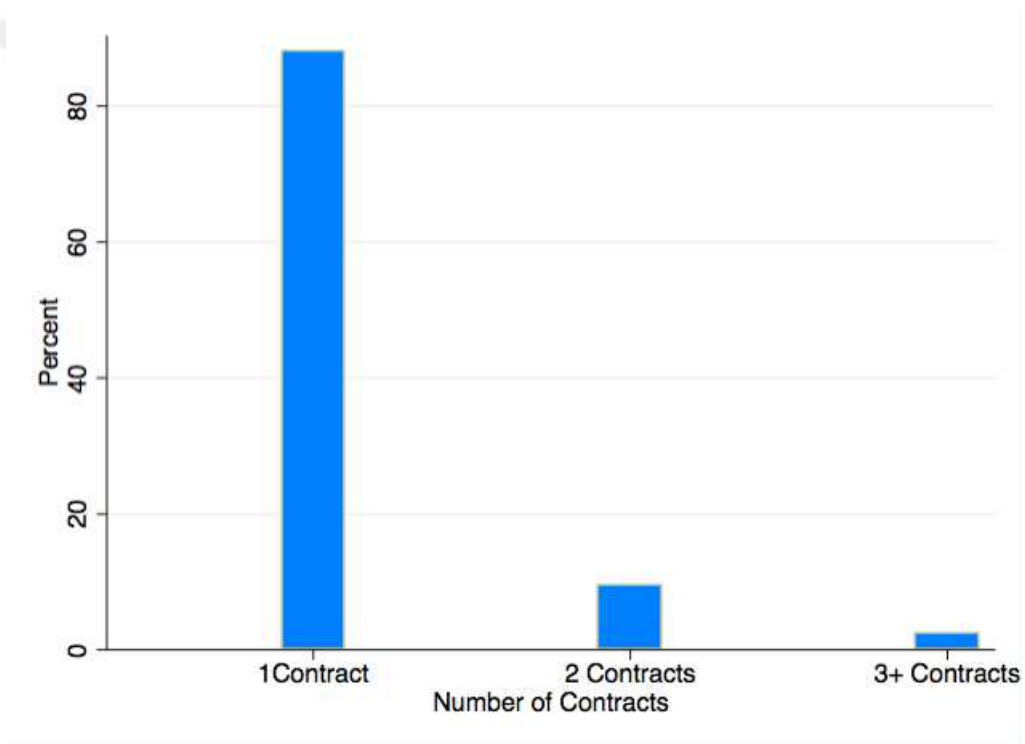


Figure 5. Histogram of number of contracts.

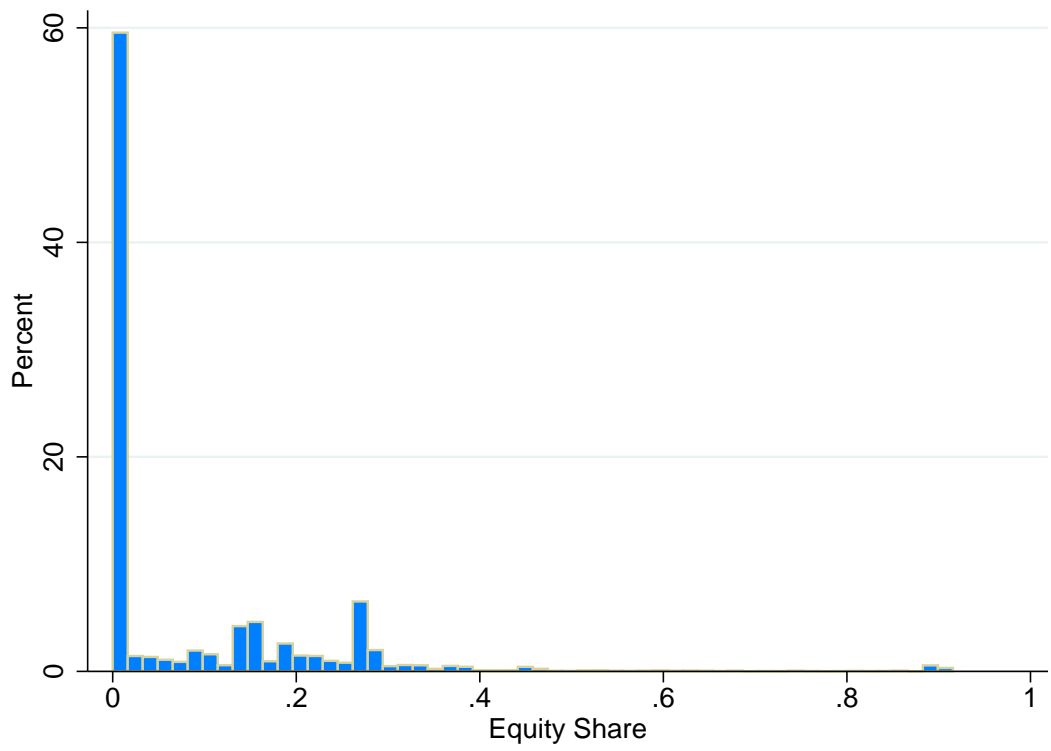


Figure 6. Distribution of equity shares.

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