

Savings Behavior, Asset Investment Choices and Institutional Pension Capital Market Performance

Jennifer Foo^a and Dorota Witkowska^b

^a *Department of Finance,
Stetson University, USA
jfoo@stetson.edu*

^b *College of Business and Economics,
University of Johannesburg, South Africa
mariaw@uj.ac.za*

ABSTRACT

This paper looks at a comparison of savings behavior choices in selected countries. Applying national, World Bank and OECD data sources, empirical analysis is provided to describe the structure of savings and changes of savings behavior in years 2006-2016. This study adds to the literature by linking and comparing the population aging process and savings behaviors for retirement. The amount and types of long-term financial assets holdings held by households will increasingly be channeled through activist institutional investors in managing the aging population's retirement financial assets holdings on their behalf. The paper also looks at the efficiency of these portfolio assets performance based on the annual real net rate of investment returns of funded and private pension arrangement managed by pension funds providers between developed and developing countries. The results would have a great significance on how pension system reforms and policies should be implemented differently.

JEL Classifications: G1, G2, G5, J11

Keywords: aging, savings, pension, capital market

I. INTRODUCTION

The current baby boomers and their aging demographics and their longer life expectancy have stirred considerable interest on their significant impact on many areas such as the greater demand for health and elderly care services as well services that cater to older lifestyles. Facing an inverted demographic pyramid, this aging trend requires the younger working population to adapt their savings behavior to consider different investment choices for retirement rather than the traditional inadequate public pension pay-as-you-go systems that are underfunded with lackluster performance returns with sustainability issues. Their savings and investment behavior and choices will also create a demand for financial services and, therefore, a significant impact on financial assets and financial markets. Baby boomers aged 51-69 now make up 75 million of the US population. According to the 2014 U.S. Census, it is projected that by 2030 those age 65 and older will comprise more than 20 percent of the population. In 2017, Europe, with 25 percent, has the largest percentage of population aged 60 and older and expected to reach 35 percent in 2050. Globally, the population aged 60 and older is expected to double by 2050 and triple by 2100 from 2017, according to the United Nations 2017 data. Life expectancy at aged 65 and older is also expected to increase over the next 50 years from 15.3 years in 2000-2005 to 18.2 years in 2045-2050, a 19 percent increase from the United Nations 2002 data. The aging demographics will have profound implications on countries and the demand for services by the aging baby boomers, including financial services to adequately fund their retirement lifestyle. According to Mandel and Wu (2015), baby boomers are expected to bring a significant level of assets of \$253,000 for the median household into retirement.

This paper explores the investment savings behavior of the aging demographics and consequent portfolio choices and the impact on the capital markets in the face of increasing life expectancy, declining fertility rates and a shrinking younger labor force. Another important question that this paper may find is whether the aging population savings behavior has become less risk averse and whether the baby boomers are taking significantly greater risky investment behavior in fueling the current record highs in the equity stock markets after the 2008 Financial Crisis to recoup their life savings losses during that period. Their changing savings behavior and patterns increasingly through private savings to supplement their 401k and public pensions, and therefore, the impact on capital markets development would become more important on a country's economic growth as labor productivity shrinks to be replaced by capital productivity. This paper looks at the global aging population crisis by comparing the differences that developed and developing countries are facing and investigate the impact on the changing savings behavior and portfolio investment impact through capital institutional investors.

II. LITERATURE REVIEW

Savings and investment behavior for retirement associated with the aging population in advanced countries tends to follow the Life-Cycle Investment Hypothesis, first put forth by Modigliani and Brumberg in 1954 and the Life-Cycle Risk Aversion Hypothesis.

Bakshi and Chen (1994) expanded on the Life-Cycle hypotheses by positing further that an investor life-savings behavior would channel more savings into home equity in early life and in the later part of life into financial portfolio assets to ensure an adequate retirement income. Therefore, the demand for housing declines and accumulation of financial assets increases with age. Savings in home equity should have an inverse relationship while financial portfolio savings should have a positive relationship with the aging. Bakshi and Chen cited literature evidence, both at the cross-section level and time series level, to support their hypothesis that as the population ages this implies that housing prices will decrease while the stock market prices will increase. Moreover, as life expectancy of persons 65 and older increases, the demand for financial investment will also be significant. The Life-Cycle Risk Aversion Hypothesis also implies that risk aversion increases as the population ages as the income source from work declines requiring an investor to be more cautious in their investment and take less risk. This is supported by Morin and Suarez (1983) who show that life-cycle behavior plays a prominent role in portfolio investment behavior by an investor with risk aversion rising with age. The positive relationship of aging with risk aversion, and therefore, higher risk premiums and flight to safer institutional investments like real estate, bonds or Treasury securities portfolio may boost capital inflows into these markets rather than the equity stock markets. Bakshi and Chen concluded that demographic changes have a positive impact on the demand for financial assets which can be a predictor of future stock returns, and that a rise in average age is followed by an increase in market risk premiums. In other words, forward-looking financial markets are taking into account the aging of the baby boomers by pricing financial assets accordingly.

Brooks (2000) posits that predictable, demographic changes have significant effects on financial assets and on the financial markets based on similar models of “consumption-saving” and “consumption-investment” behavior of baby boomers. The author finds that as rational, forward-looking investors and by choosing a portfolio of risk-averse bonds over risky stocks as aging progresses when saving for retirement, the returns to baby boomers will be significantly lower than their previous overlapping generations.

Boersch-Supan and Winter (2001) look at the developed European countries’ population aging and their impact on savings behavior and the need for pension reforms. Their study finds that population aging will increase retirement savings between 2015 and 2025 and decline thereafter, with a higher share of savings flowing through the stocks and bonds, thereby expanding the capital markets, particularly in France, Germany, and Italy that have low stock and bond capitalization. The authors, therefore, argue that the increased productivity and efficiency from the expanding capital markets will compensate for the transition burden from the dominant pay-as-you-go European pension system to the pre-funded system. A further study by Boesch-Supan, Ludwig and Winter (2001) looks at population aging and the impact of capital flows across inter-generations and across countries. The study finds that capital stock increased as a result of baby boomers saving for retirement but decreased after 2030 when they begin consuming their retirement savings. Moreover, they also experience a decreasing rate of return on capital as the capital-labor ratio decreases as they age. The rate of capital return is mitigated when capital mobility and international capital flows are incorporated into the model. However, their model did not take into account risk aversion of international portfolios nor imperfections in capital markets mobility and exchange rates.

A study by Granville and Mallick (2004), on the other hand, argued that there is no clear evidence that capital market reforms of pension schemes to increase privately funded pension schemes will increase aggregate savings, but instead would offset other savings. They argued for both public and private pension schemes. The positive impact of pension reforms, however, is the channeling of long-term savings to the capital markets leading to increased liquidity and capitalization of the stock market with more efficient allocation of resources and growth.

A comprehensive literature survey by Bosworth, Bryant and Burtless (2004) looks at the impact of population aging on financial markets and household saving and investment behavior, on financial market pricing of assets and returns, and the effects of globalization and demographic change. Their survey of the literature on population aging and their savings and investment behavior is in accord with the life-cycle models. As the labor force growth slows with the aging of the population, the demand for domestic investment may offset the expected decline in domestic savings although the literature is not conclusive about the magnitude of the changes. As to the impact of financial assets pricing and returns, population aging and their savings behavior affect the demand for different classes of financial assets and stock market pricing and their real rates of returns depending on the sample data and countries studied, but there is no firm consistency from the literature surveyed. With faster population aging in developed countries, the decline in domestic demand for investment funds will tend to channel investment funds flow to developing countries where there is greater demand.

European transition, post-communist countries are uniquely affected by their population aging and the future fiscal and social burden requiring a need to implement extensive pension reforms, having transitioned from the previous state dependency to multi-pillar public and private pension schemes of inter-generational risk sharing of public schemes and risk sharing through capital markets. The dilemma is to balance between the greater risk exposure from financial markets with better financial regulations and developing and deepening financial markets, while allowing for the benefits from potentially higher returns for retirement from investing in capital markets. Nickel and Almenberg (2006) advocate a policy of mandatory funded pension scheme for retirement for transition countries resulting in a greater flow of savings to increase the growth and deepen the development of the transition capital markets. The growth and deepening of the transition capital markets in turn would provide greater portfolio diversification and investment opportunities and mitigate the greater risk from financial markets investment for retirement. A particular obstacle faced by transition countries is the regulatory restrictions by many transition countries on international diversification which, while promoting the development of domestic capital markets, come at the expense of investors facing higher domestic risk from under-diversified retirement portfolios.

More recent literature similarly indicates that the aging of baby boomers will have a significant impact on the capital markets. Liu and Spiegel (2011) find a strong relationship of the U.S. population age distribution and stock market performance depressing stock valuation as they liquidate their risky stock portfolio to finance their retirement. Their model looks at how price/earnings (P/E) ratio depends on the population age distribution ratio (M/O) of the middle-age group, age 40-49, to the old-age group, age 60-69, with strong positive correlations. The middle-age group would tend to be savers and invests more in stocks, driving up prices, while the old-age group would tend to liquidate their retirement savings and stocks and/or readjust their portfolio choice with

a higher proportion of safer assets like bonds to finance their retirement. Their study projected that from 2011-2030 the P/E declined consistently before recovering in 2030 and that the projected real stock prices also persistently declined until 2021, and will not fully recover until 2025, and by 2030 will be about 20% higher than the 2010 level.

III. SAVINGS BEHAVIOR AND POPULATION AGING EFFECTS ON CAPITAL MARKETS

The expected magnitude of the population aging of the baby boomers' savings and investment portfolio choices and the possible impact on the capital markets have been of interests to both researchers and financial advisor and institutions. Not only will it impact the structure of financial markets and the valuation of the financial assets, but also the potential international capital flows as global investment opportunities increase. However, the process is gradual and slow as the cohort population ages over decades.

The life-cycle savings and investment hypotheses have been the basic framework for evaluating the savings and investment behaviors when looking at population aging and their impact on capital markets and financial assets valuation. The life-cycle savings and investment hypotheses posit that the savings behavior of young household increases and becomes negative when savings are liquidated to fund retirement. In particular, young households have little investment in stocks initially, and progressively increase their proportion of risky assets as they age, and switch and reallocate to less risky assets when closer to retirement resulting in a life-cycle, hump-shaped risky asset holdings (Ameriks and Zeldes 2004). Moreover, a typical financial planner's advice to investors is based on the premises of this saving and investment behavior for retirement: that the optimum financial asset allocation rule of thumb in planning for retirement is 70% in stocks at aged 30 and 30% in stocks at aged 70. However, most households at aged 30 typically do not own stocks due to starting families and investing in a home equity, and progressively increase their risky stock holdings over middle-aged, typically 40-59, and decrease their risk exposure to stocks as they approach retirement at age 60 and older, resulting in the hump shaped of the lifecycle stock holding portfolio allocation as they age. Countries like the U.S. and western developed European countries exhibit a hump shaped relationship between population aging and the proportion of risky assets consistent with the investor's hump-shaped lifecycle portfolio decisions (Modigliani 1986, Benzoni and Goldstein 2010). The concern is the depressing of the stock market pricing from the massive liquidation of stocks by the baby boomers and the consequences of altering the financial capital market structures. Bakshi and Chen (1994) attributed the 1980s-90s stock market booms to the middle-aged baby boomers entering this phase of their life-cycle of accumulating stocks for their retirement.

While the recent stock market boom since 2010, after the 2008 Financial Crisis, has been beneficial for boosting the baby boomers' nest egg as they head towards retirement, the implication for the future is that demographic shifts will depress stock prices as they divest their portfolio choices from risky stocks. The U.S. stock market has not only recovered for almost a decade but has maintained their recovery and in 2017 and early 2018, have been hitting numerous record highs. Other factors may drive the upward trend of the U.S. stock market valuation, such as greater investor confidence of a sustained U.S. economic recovery and optimism of more business-friendly policies and greater foreign demand for U.S. equity as capital control restrictions are relaxed by

emerging countries, like China, and as developing economies grow and achieve a higher income and standard of living to invest in developed countries. These factors may offset the expected decline in stock valuation. Moreover, other developed countries like Japan and European countries, are facing a population that is aging faster than the U.S. population. Foreign risk aversion may also alleviate the U.S. stock market decline in favor of domestic investment.

According to the World Bank, Japan has the highest percentage of population 65 and older (27%), followed by Italy (23%), and Germany (21%) in 2016. In contrast, the U.S. is considerably better off with 15% while most of the European countries similarly have higher population aging than developing and emerging countries. The 2015 National Japanese Census reports that those aged 65 and older accounts for 26.7% of the total population in 2015, up from 23% from five years ago, the highest ever recorded as baby boomers entered this age group with the labor force population declining to 59.8%. Japan also has the highest life expectancy. Japan as a country would provide a good basis to test the current life-cycle of savings and investment behavior models.

A recent, significant study by Iwaisako et al (2016), investigates the impact of Japanese population aging on household savings and portfolio choice behaviors. In particular, their paper examines whether baby boomers have begun divesting their risky assets, such as stocks, as the population ages. Their study concludes that currently there is no evidence that there is a significant drop in stock holdings even though Japanese household savings have decreased. The authors find that the average risky assets of Japanese households increase with age and did not decline significantly even for those aged 60 and older. Rather the Japanese population aging and their proportion of risky assets exhibit an upward trend, primarily from shifting their portfolio from safer bank deposits to stocks, which explains the increase in the proportion of stocks held by the elderly households. This most recent study of household savings behavior and portfolio choice and risk aversion in relation to population aging seems to differ in contrast to the hump shaped life-cycle savings and investment hypotheses. The aging of the population may actually have induced the elderly to more risk-taking behavior than less in the last 15 years. This behavior may be due to the Japanese elderly being diligent savers, thereby accumulating more wealth and working longer after aged 60 than 10 years ago, and also planning for their expected longer life expectancy. This behavior is contrary to the elderly divesting their risky stock portfolio leading to the expected stock market depression and may instead lead to a positive upward trend relationship of population aging to the stock market pricing.

Our paper investigates whether the relationship of population aging behavior follows the lifecycle savings and investment hypotheses with the typical expected hump shaped. However, a more recent study by Iwaisako et al (2016) shows that as the Japanese population ages, the savings and investment behavior of the baby boomers is on a positive upward trend. Contrary to theories, their study shows that the baby boomers may be willing to take on greater risky behavior in their portfolio asset allocation choices to fund their retirement as they age. By comparing the U.S., certain selected European countries, and Japan, our paper also looks at other variables that may influence their asset allocation behavior such as longer life expectancy, working longer, and better provision of health care as they age.

IV. EMPIRICAL ANALYSIS

The data source of our empirical research is based on comparable data from OECD countries. However, we also use other data sources for our country studies. It should be noted that the majority of countries compile data according to the 2008 SNA “System of National Accounts, 2008” with the exception of Chile, Japan, and Turkey, where data are compiled according to the 1993 SNA.

For our study, we look at the changes in household savings of selected countries during the years of analysis. We consider only countries where data are available including other significant non-OECD member countries, such as China, Russia and South Africa, which have available comparable data. Therefore, our study looks at 27 OECD countries with the addition of China, Russia, and South Africa. In our study we provide a deeper analysis for Germany, Japan, Poland and USA since the USA represents the biggest economy, Germany is the strongest country in Europe, Japan is highly developed in Asia, and Poland is the biggest economy among European transition, post-communist countries.

A. Changes of household savings rates

The household savings rate describes the percentage share of savings in disposable income:

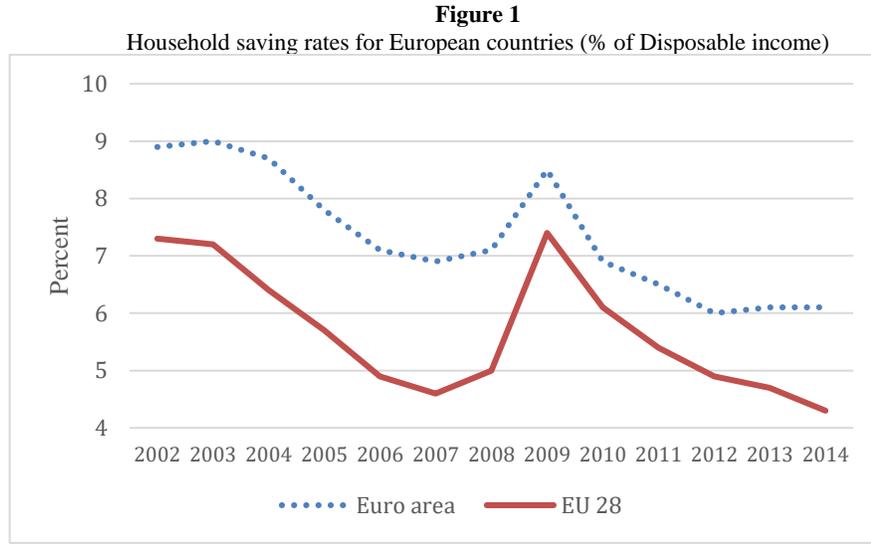
$$SR = \frac{\text{income} - \text{consumption}}{\text{income}} \cdot 100\% \quad (1)$$

This is the most common measure of households’ savings. The saving rate can be measured as gross or net of depreciation.

The savings in the majority of OECD countries including China, Russia and South Africa from 2002-2014 are presented in Appendix Table A1. It is clear that saving behaviors are different among different countries and years from the minimum value for Greece in 2013 (-16.4%) to maximum for China in 2010 (42.1%). The former example implies that Greek households consumed much more than their available disposal incomes while the latter shows that Chinese households save more than 40 percent of their disposal incomes. In general, the outstanding saving rates are observed for China in all the years, since the arithmetic mean for the 30 countries for the years 2002-2014 is 6.1%, with a median of 5.4% and a fourth quartile of 9.2%.

Analyzing the average (not weighted) savings rates calculated for each year, it is noted that the highest values were obtained in the years 2009 and 2010 for all considered countries (8.2% and 7.2%, respectively) and for 2009 if only OECD members are taken into account (7.1%). For the European Union (28) and Euro zone countries, the highest values were obtained in 2002, 2003 and 2009 (7.3%, 7.2% and 7.4% for EU28, and 8.9%, 9.0% and 8.5%, respectively). In other words, households increased their tendency to save during economic and financial crises in Europe (Figure 1). The lowest average household saving rates were observed in 2005 among OECD countries (4.07%) and in 2014 for all considered countries (4.38%). Among the 30 analyzed countries, 11

of them experienced negative household saving rates at least in one year. Greece and South Africa show negative rates in all reported years, Denmark for 8 years, New Zealand for 7, Estonia and United Kingdom for 6, Portugal for 5, Ireland and Poland for 2 years.



Source: Own elaboration based on Table A1.

The average saving rates are evaluated for each country which are ranked and clustered into four groups:

- using quartiles, and
- applying arithmetic mean and standard deviation to evaluate the threshold value for each group, to obtain thresholds values, based on the following criteria:
 1. group of countries with the highest values of savings rates for:

$$SR_i > \overline{SR} + S_{SR} \quad (2a)$$
 2. group of countries with high values of savings rates for:

$$\overline{SR} + S_{SR} \geq SR_i > \overline{SR} \quad (2b)$$
 3. group of countries with medium values of savings rates for:

$$\overline{SR} \geq SR_i > \overline{SR} - S_{SR} \quad (2c)$$
 4. group of countries with the lowest values of savings rates for:

$$SR_i \leq \overline{SR} - S_{SR} \quad (2d)$$

where \overline{SR} , S_{SR} denote the average and standard deviation of household savings rates evaluated for the i -th country using available data from years 2002-2014.

Using quartiles, all the countries are clustered into four groups with similar count of countries in each group. Using the arithmetic mean, all the countries are clustered into the four groups of countries with similar levels of savings rates based on their threshold values, and where the number of countries in each group is not defined a

Table 1
Ranking and clustering of countries
according to household saving rates (% of Disposable income)

No.	Classification made on the basis of median	Average in %	Clustering based on arithmetic mean (%)					Class
			All countries	China excluded	Countries with two lacking data	European countries		
1	China	37.73	China	Switzerland	China	Switzerland	I	
2	Switzerland	16.42	Switzerland	Russia	Switzerland	Russia		
3	Russia	12.36	Russia	Sweden	Sweden	Sweden	II	
4	Sweden	10.47	Sweden	France	France	France		
5	France	10.06	France	Germany	Germany	Germany		
6	Germany	9.86	Germany	Austria	Austria	Austria		
7	Austria	9.71	Austria	Chile	Belgium	Belgium		
8	Chile	9.39	Chile	Belgium	Mexico	Slovenia		
9	Belgium	8.48	Belgium	Mexico	Slovenia	Italy		
10	Mexico	7.99	Mexico	Slovenia	Italy	Czech Rep.		
11	Slovenia	7.39	Slovenia	Italy	Czech Rep.	Netherlands		
12	Italy	6.55	Italy	Czech Rep.	Netherlands	Ireland	III	
13	Czech Rep.	6.42	Czech Rep.	Netherlands	Australia	Spain		
14	Netherlands	6.11	Netherlands	Australia	USA	Hungary		
15	Australia	5.77	Australia	USA	Ireland	Poland		
16	USA	5.03	USA	Ireland	Spain	UK		
17	Ireland	4.51	Ireland	South Korea	Hungary	Portugal		
18	South Korea	4.50	South Korea	Spain	Canada	Denmark	IV	
19	Spain	3.73	Spain	Hungary	Poland	Estonia		
20	Hungary	3.66	Hungary	Canada	Japan	Greece		
21	Canada	3.50	Canada	Poland	UK			
22	Poland	2.97	Poland	Japan	Portugal			
23	Japan	1.76	Japan	UK	Denmark			
24	UK	1.40	UK	Portugal	N. Zealand			
25	Portugal	0.75	Portugal	Denmark	Estonia			
26	Denmark	-1.22	Denmark	S. Africa				
27	South Africa	-1.49	S. Africa	N. Zealand				
28	New Zealand	-1.62	N. Zealand	Estonia				
29	Estonia	-2.66	Estonia	Greece				
30	Greece	-7.34	Greece					
	\overline{SR}	6.07	6.07	4.98	6.59	5.48		
	S_{SR}	7.66	7.66	5.00	7.66	5.45		
	$\overline{SR} + S_{SR}$	13.74	13.74	9.98	14.25	10.93		
	$\overline{SR} - S_{SR}$	-1.59	-1.59	-0.02	-1.06	0.04		

Source: Own elaboration based on Appendix Table A1.

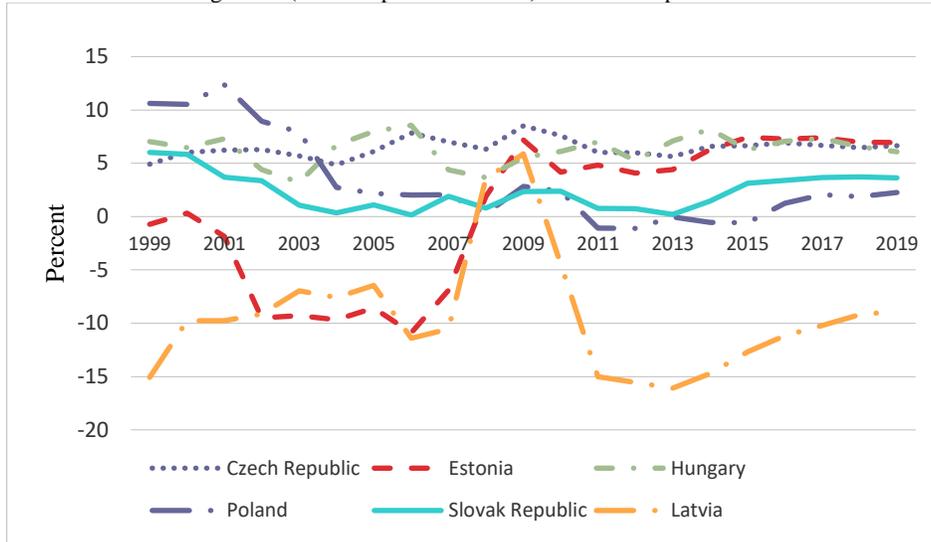
priori. The results of the countries clustering are presented in Table 1. Applying both the quartile and the threshold values clustering, we obtain four clusters: I class containing countries with the highest level of saving rates; II class countries with high level of saving rates; III class countries with medium level of saving rates; and IV class countries with the lowest level of saving rates. From the arithmetic mean clustering, which is sensitive to outliers, we distinguished four sets of countries containing a different number of countries:

- (1) all countries – the set contains 30 countries,
- (2) all countries excluding China, which has outlier observations, – the set contains 29 elements,
- (3) all countries excluding countries with three and more missing observations – the set contains 25 elements,
- (4) European countries – the set contains 20 elements.

In other words, the clustering procedure is applied four times. From Table 1, the group of countries with the highest rates of household savings (as a percentage of disposable income) are China and Switzerland, for the largest 30 countries sample, and the Russian Federation, Sweden and France in the smaller sample groups. The countries with the lowest saving rates are: New Zealand, Estonia and Greece for the whole sample, and South Africa and Denmark in the smaller sample groups, which are characterized by negative households saving rates.

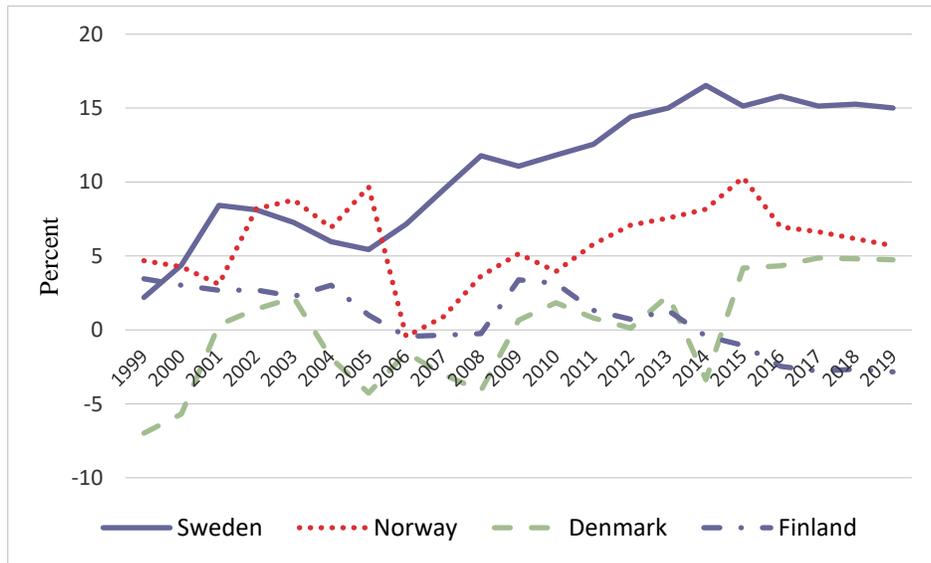
The countries are also classified according to their economic positions and/or geographical locations based on similar history and culture to compare patterns of savings for 1999-2019 (Figures 2-7). It should be noted that the values of savings rates are not fully comparable because for the majority of the countries the net saving rates are calculated but for others the gross savings rate is calculated (the countries marked by * in Figures 4-5). Although the savings rates may have different values but the general trend patterns can be observed and compared .

Figure 2
Household savings rates (% of Disposable income) in East-European transition countries



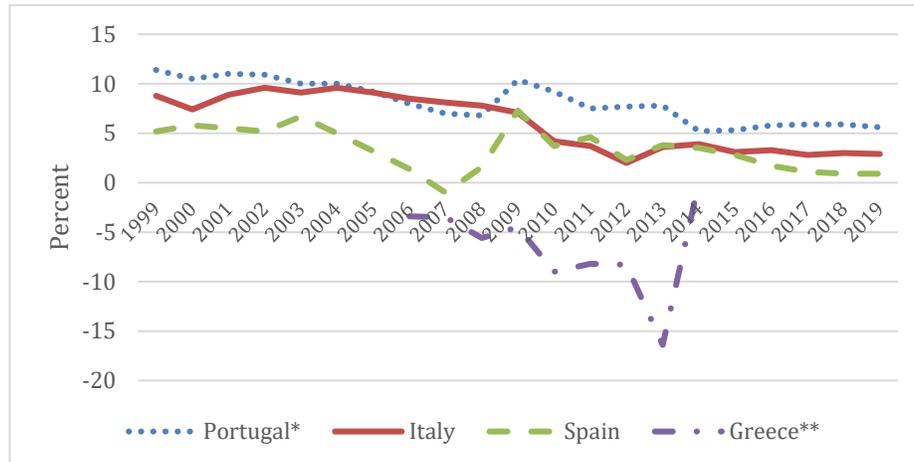
Source: Own elaboration based on data OECD Economic Outlook, Volume 2017 Issue 1 and 2 - OECD 2017.

Figure 3
Household savings rates (% of Disposable income) in Scandinavian countries



Source: Own elaboration based on data OECD Economic Outlook, Volume 2017 Issue 1 and 2 - OECD 2017.

Figure 4
Household savings rates (% of Disposable income) in South-European countries

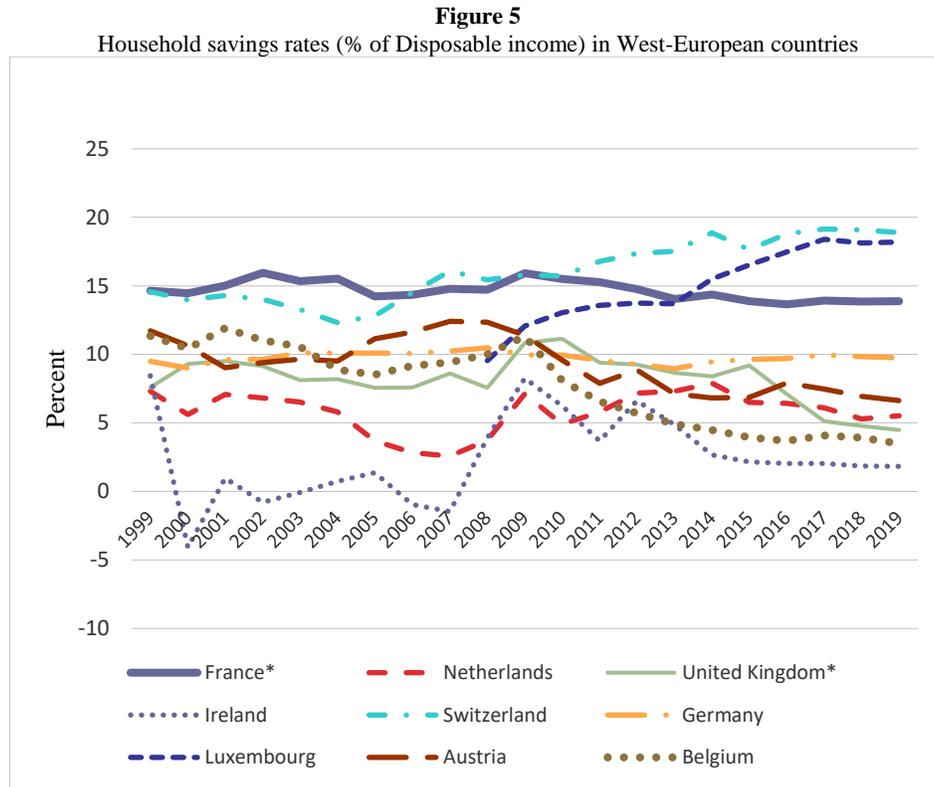


Source: Own elaboration on the basis of data OECD Economic Outlook, Volume 2017 Issue 1 and 2 - OECD 2017. Note: data for Greece (denoted by **) are taken from OECD Factbook 2015-2016, for the countries marked by * gross savings rate is calculated.

For the transition, post-communist countries the patterns of saving are similar except for two Baltic states, Latvia and Estonia (Figure 2). Poland is characterized by a systematic decrease in the savings rate while Slovak and Czech Republics and Hungary seem to be stable in the level of household savings.

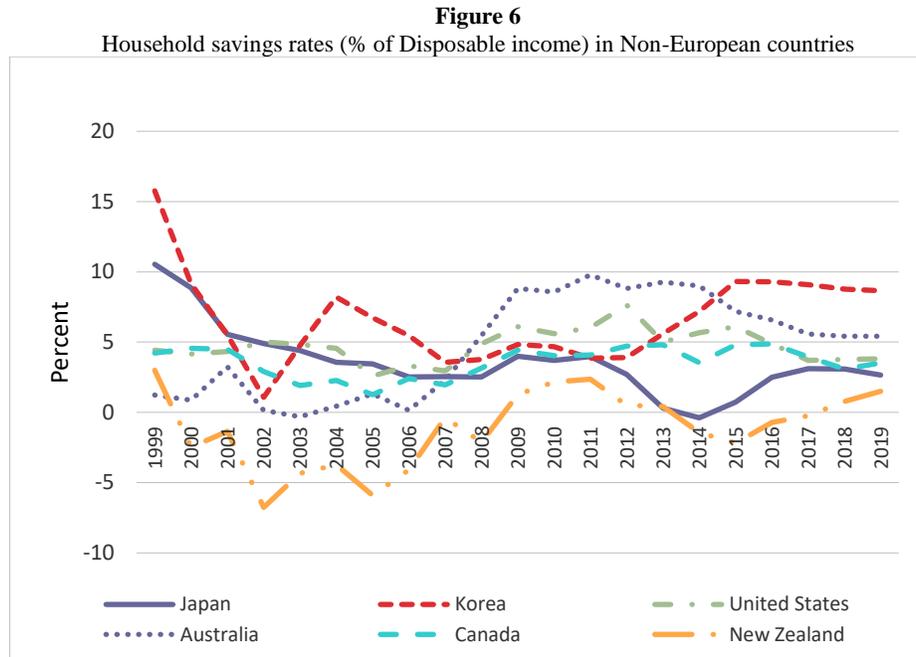
There is no obvious pattern of savings in Scandinavian countries (Figure 3). In Sweden the savings rate has been increasing, in Norway it has been increasing since 2007. For Denmark the savings rate started from a negative value but in the long-term it has been increasing while for Finland it seems to be the opposite.

Portugal, Italy and Spain are characterized by decreasing savings given as a percentage of the households' disposable incomes (Figure 4). For Spain, the steep decrease is noticeable in 2007, for Greece in 2013 when its debt crises occurred. The Greek society were living on credit in the years 2006-2014 although the tendency might change in following years.

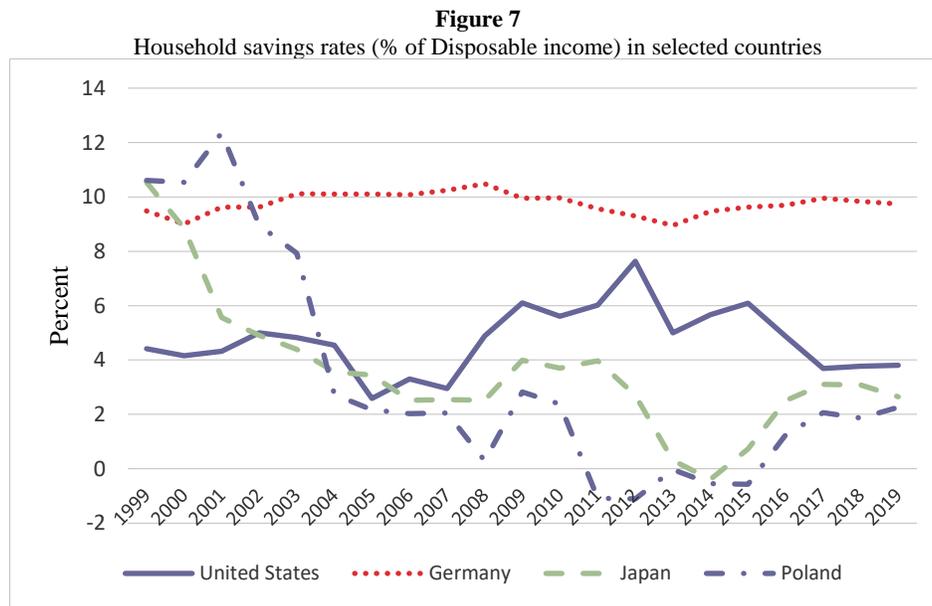


Source: Own elaboration based on data OECD Economic Outlook, Volume 2017 Issue 1 and 2 - OECD 2017.
Note: data for Luxembourg are available in years 2008-2019, for the countries marked by * gross savings rate is calculated.

The savings behaviors in Switzerland, France and Germany seem to be quite stable and in Luxemburg the saving rate has been increasing (Figure 5). In UK, Austria, the Netherlands, Ireland and Belgium, savings have been decreasing slightly. However, the most notable differences are for Belgium and Ireland in 2009 where household savings rates were much lower in a decreasing trend initially relative to the other West-European countries but became more stabilized later.



Source: Own elaboration based on data OECD Economic Outlook, Volume 2017 Issue 1 and 2 - OECD 2017.



Source: Own elaboration based on data OECD Economic Outlook, Volume 2017 Issue 1 and 2 - OECD 2017.

Similar savings rates patterns are observed for the USA and Canada, which seem to be quite stable, and also for Australia and New Zealand with similar characteristics

although savings in the latter are mostly negative (Figure 6). Japan and South Korea show different patterns with the former being quite stable and similar to the US pattern till 2010, but the latter has a completely different behavior. However, after a significant decrease in 2002 the South Korean household savings rate seems to be increasing in the long-term.

Figure 7 shows a comparison of household savings in the three strongest developed economies: USA in Americas, Japan in Asia, Germany in Europe and Poland for transition countries. Germany has a stable savings rate due to its stable economy as the affluent part of the people do not need to use savings to support their current consumption especially during economic hard times. A decreasing savings rate is observed in Japan and Poland till 2004. In the years 2004-2007 the level of savings seems to be very similar for Japan, USA and Poland, then the paths diverge till 2017.

The patterns of savings behaviors as discussed above are supported by trend functions:

$$SR_t = \alpha + \beta t + \varepsilon_t \quad (3)$$

where, SR_t is household saving rate; t – time variable; α , β – parameters; ε_t random coefficient. Trend functions were estimated for four countries using data from the period 1999-2017 (Table 2). Japan and Poland have significantly negative trend coefficient, that is, the savings has been decreasing systematically by 0.35% and 0.64%, respectively every year. In the USA, the saving rate seems to increase but insignificantly by 0.08% annually, while for Germany the trend function indicates a stable savings behavior.

Table 2
Parameter estimates of trend functions estimated for selected countries

Parameter	United States		Germany		Japan		Poland	
	β	α	β	α	β	α	β	α
estimates	0.0821	4.0028	-0.0043	9.7968	-0.3540	7.1954	-0.6354	9.7659
t-Student statistics	1.6806	7.1830	-0.2459	48.5758	-4.8548	8.6546	-5.9364	8.0022
R ²	0.1425		0.0035		0.5810		0.6746	

Source: Own elaboration. Note: bold numbers denote rejection of hypothesis (about parameter equals zero) at the significance level 0.05.

B. Comparison of households' financial assets investment in the years 2008 and 2014

Wealth and income are key measures of a household's standard of living. Household income measure is disposable income after consumption spending while wealth may include both financial and non-financial assets such as land, houses and intellectual properties. Household financial assets are classified according to the 2008 System of National Accounts which are currency and deposits, debt securities, equity, investment funds shares, life insurance and annuity entitlements, and pension entitlements and entitlements to non-pension benefits. Among the OECD countries in our study, there are significant differences in the investment structure of the financial assets choices of the households, which carry different risk levels (Tables 3-6). We apply similar classification patterns as presented by formulas (2a)-(2d) to distinguish groups of countries with similar

shares of financial assets as a percentage of total financial assets of the households, as follow:

1. group of countries with the highest shares of financial assets for:

$$SF_i > \overline{SF} + S_{SF} \quad (4a)$$

2. group of countries with high shares of financial assets for:

$$\overline{SF} + S_{SF} \geq SF_i > \overline{SF} \quad (4b)$$

3. group of countries with medium shares of financial assets for:

$$\overline{SF} \geq SF_i > \overline{SF} - S_{SF} \quad (4c)$$

4. group of countries with the lowest shares of financial assets for:

$$SF_i \leq \overline{SF} - S_{SF} \quad (4d)$$

where \overline{SF} , S_{SF} denote the average and standard deviation of shares of financial assets evaluated for the i -th country using available data from years 2008 and 2014. We also distinguish a class “not classified” which includes countries with lacking data.

Currency and deposits (Table 3) are the most popular in Greece in 2008 and Turkey in 2014 held by the first group (I) according to classification (4), but the least popular in the USA with the smallest share of financial assets held by households. Chile, Sweden and Denmark also have a small share of this type of assets and together with USA created the fourth (IV) group in both analyzed years. The third group (III) contains 11 countries in both years but nine of them, Australia, Belgium, Canada, Estonia, France, Italy, Netherlands, Norway and United Kingdom belong to this class in 2008 and 2014, whereas Israel and Switzerland only in 2008. Finland and Hungary also belong to this group but only in 2014. The group (II) that holds the second highest amount of currency and deposits contains 9 and 10 countries in both years, respectively. In 2008, this class is created by Hungary and Finland, moving to (III) class in 2014, together with Germany, Portugal, Ireland, Austria, Poland, Spain and Slovenia which stayed in this class also in 2014 with the addition of South Korea, Luxemburg and Czech Republic. The group (I) that holds the highest amount of currency and deposits is created by Greece and Slovak Republic in both years, together with Luxembourg, Czech Republic, and Japan in 2008, and Turkey in 2014. There is lack of data for Turkey and South Korea in 2008 and for Israel, Switzerland and Japan for 2014. Therefore, they cannot be classified for these years.

It can be assumed that if a household in a country has a bigger proportion of their total financial assets in the form of cash and deposits rather than invested in more sophisticated financial assets like stocks, bonds, and other financial instruments, the domestic financial markets would be less developed and offer less financial product choices than countries classified to the fourth class. Post-communist and South European countries usually belong to the first and second classes, except Italy and Estonia which belong to the third class in both years and Hungary in 2014.

Table 3

Clustering of countries according to Currency and Deposits (% of Total financial assets)

Year	2008		2014	
IV class	USA	14.3	USA	13.2
	Chile	14.4	Chile	13.7
	Sweden	16.4	Sweden	14.3
	Denmark	21.3	Denmark	16.4
III class	Estonia	22.7	Netherlands	19.6
	Netherlands	22.7	Australia	22.2
	Australia	23.7	Canada	23.3
	Canada	26.6	UK	24.0
	Israel	27.4	Estonia	28.0
	UK	28.1	Norway	28.6
	Switzerland	28.8	France	28.7
	Italy	29.2	Hungary	29.1
	Norway	29.4	Belgium	30.5
	Belgium	30.3	Finland	31.5
	France	30.4	Italy	31.5
II class	Hungary	37.5	Ireland	36.9
	Finland	39.1	Germany	39.3
	Germany	39.4	Austria	41.0
	Portugal	41.8	South Korea	42.0
	Ireland	42.7	Portugal	43.0
	Austria	44.5	Spain	43.0
	Poland	46.4	Poland	46.7
	Spain	46.7	Slovenia	49.0
	Slovenia	47.9	Luxembourg	50.8
	I class	Czech Rep.	52.9	Czech Rep.	50.9
Japan		53.7	Slovak Rep.	61.8
Luxembourg		54.5	Greece	66.9
Slovak Rep.		61.8	Turkey	79.8
Greece		71.4	Israel	..
Not classified	South Korea	..	Japan	..
	Turkey	..	Switzerland	..

Source: Own elaboration based on OECD Factbook 2015-2016.

Debt securities investment are the most popular in Italy and the least in Chile (0.0%) (Table 4). The group (I) with the most debt securities investment is created by Italy and Luxembourg for both years of the analysis, and Israel together with South Korea and Turkey in 2008, while in 2014 Belgium, Austria, and Hungary also belong to this class. USA, Portugal and Germany (in both years), Austria, Greece, Switzerland, Belgium, and Hungary in 2008, and South Korea, Czech Republic, and Finland in 2014 with the second most debt securities investment, create the second class (II). Other countries belong to the group with the least debt securities investment (III), and no countries were classified into class (IV) based on the classification criteria.

Table 4
Clustering of countries according to Debt Securities and Equity (% of Total financial assets)

Year	Debt securities			Year	Equity				
	2008	2014	Class		2008	2014	Class		
III	Chile	0.0	0.0	Chile	IV	Slovak Rep.	0.3	0.2	Slovak Rep.
	Ireland	0.1	0.1	Estonia		Japan	6.4	7.0	UK
	Slovak Rep.	0.2	0.1	Ireland		Greece	6.9	8.1	Netherlands
	Czech Rep.	0.6	0.2	Australia		UK	7.3	8.6	Turkey
	Australia	0.7	0.3	Poland	III	Switzerland	9.3	9.9	Germany
	Estonia	0.8	0.4	Norway		Germany	9.4	12.6	Luxembourg
	Norway	0.8	0.5	Netherlands		Israel	10.2	13.7	Ireland
	Poland	1.0	0.7	Slovenia		Luxembourg	11.6	15.6	South Korea
	Slovenia	1.4	1.3	Spain		Netherlands	12.0	17.9	Chile
	UK	1.4	1.4	Greece		Canada	16.2	18.0	Australia
	Netherlands	1.8	1.4	Slovak Rep.		Ireland	16.2	18.6	Poland
	Finland	2.1	1.4	Sweden		Austria	16.6	19.2	Canada
	France	2.2	1.6	Denmark		France	17.9	20.4	Austria
	Spain	2.2	1.7	France		Australia	18.8	20.4	Greece
	Sweden	2.5	1.7	UK		Poland	19.6	20.5	France
	Canada	3.2	1.8	Canada	II	Portugal	20.7	21.1	Portugal
	Japan	4.3	2.6	Turkey		Denmark	20.9	21.5	Norway
	Denmark	4.9	3.6	Finland		Norway	21.2	21.7	Czech Rep.
II	Portugal	5.2	3.8	Germany		Belgium	23.0	22.0	Italy
	Hungary	5.6	3.9	Czech Rep.		Spain	23.7	22.2	Slovenia
	Germany	6.3	3.9	Portugal		Italy	24.4	23.6	Denmark
	Austria	8.8	4.6	USA		Czech Rep.	25.1	25.8	Belgium
	Greece	9.0	5.8	South Korea		Slovenia	25.2	26.0	Spain
	USA	9.2	6.5	Belgium		Chile	26.0	29.0	Hungary
	Switzerland	9.4	7.1	Austria		Hungary	26.9	34.1	USA
	Belgium	10.0	7.7	Luxembourg		USA	28.9	35.0	Sweden
I	Luxembourg	11.8	8.4	Hungary		Finland	29.4	36.5	Finland
	Israel	17.6	13.4	Italy		Sweden	29.5	52.8	Estonia
	Italy	21.3			I	Estonia	63.4		
Not classified					Not classified				
South Korea		..	Israel		South Korea				Israel
Turkey		..	Japan		Turkey		..	..	Japan
		..	Switzerland				..	..	Switzerland

Source: Own elaboration based on OECD Factbook 2015-2016.

Equities are the riskiest among the financial assets of households but usually provide the highest returns for investors over the long term. They seem to be the most popular in Estonia since 63.4% and 52.8% of households' financial assets are invested in stocks in the years 2008 and 2014, respectively, group (I). The Finish, Swedish and US households belong to the same group but only in 2014 with the stocks comprising 36.5%, 35.0% and 34.1% of household financial assets, respectively. The second group of countries (II) holding equity investments are Czech Republic, Denmark, Belgium,

Hungary, Italy, Portugal, Slovenia and Spain in both years, and USA, Sweden, Finland and Chile in 2008, whereas Slovakia and UK, in both years together with Greece and Japan in 2008, the Netherlands and Turkey in 2014 belong to the fourth class (IV) that hold the least equity investment. It is worth mentioning that the smallest share of equities among financial assets of households is observed for Slovak Republic (0.3% and 0.2% for both years) while other countries from that group have from 6.4% to 9.9% of equities in their portfolios for both analyzed years (Table 4). The rest of the countries are classified to the third class (III) or are not classified because of lack of data.

Table 5
Clustering of countries according to Investment Funds
Shares and Life Insurance and Annuities (% percentage of Total financial assets)

Year	Investment funds shares			Life insurance and annuities				
	2008	2014	Year	2008	2014			
IV class	Australia	0.0	0.0	Australia	Australia	0.0	0.0	Australia
	Ireland	0.0	0.0	Ireland	Estonia	1.4	0.6	Turkey
	Israel	0.0	0.8	Estonia	USA	2.3	1.9	USA
	Estonia	0.4	1.6	Turkey	Greece	2.5	2.0	Estonia
III class	Greece	2.1	2.6	Greece	Norway	4.2	2.2	Greece
	UK	2.5	2.9	Netherlands	Slovenia	5.1	3.2	Norway
	Netherlands	3.1	3.6	Portugal	Hungary	5.2	4.6	Hungary
	Japan	3.2	3.6	Slovenia	Switzerland	5.6	4.8	Poland
	Norway	3.2	3.7	South Korea	Czech Rep.	5.8	5.7	Czech Rep.
	Slovenia	3.3	4.1	Norway	Spain	5.9	6.9	Finland
	Chile	4.2	4.2	UK	Poland	7.0	7.3	Slovak Rep.
	Portugal	4.4	5.4	Chile	Finland	7.3	7.5	Slovenia
	Czech Rep.	4.9	5.5	Czech Rep.	Luxembourg	7.8	7.5	Spain
	Denmark	5.3	6.0	Poland	Slovak Rep.	8.3	8.4	Netherlands
	Poland	5.6	6.5	France	Italy	9.1	9.5	Sweden
	II class	Finland	6.0	7.3	Denmark	Israel	9.2	10.4	UK
Italy		6.0	7.3	Slovak Rep.	Netherlands	10.4	12.1	Austria
Hungary		6.9	8.3	Sweden	Portugal	12.3	12.2	Luxembourg
Slovak Rep.		7.1	8.4	Austria	UK	12.6	12.7	Chile
Austria		7.2	9.1	Finland	Austria	12.9	12.7	Portugal
Sweden		7.2	9.5	Germany	Chile	13.0	13.2	Italy
France		7.9	9.7	Italy	Sweden	14.2	15	Belgium
Spain		8.8	10.7	Hungary	Japan	14.5	16.2	Ireland
Switzerland		8.9	11.4	Spain	Belgium	14.7	16.8	Germany
Germany		9.0	11.9	Luxembourg	Ireland	15.0	21.1	South Korea
I class	USA	10.5	12.4	Belgium	Germany	16.5	27.8	Denmark
	Luxembourg	11.1	13.0	USA	Denmark	24.5	34.4	France
	Belgium	12.4	18.0	Canada	France	33.6	..	Canada
	Canada	15.0	..	Israel	Canada	..	..	Israel
Not classified	South Korea	..	..	Japan	South Korea	..	..	Japan
	Turkey	..	..	Switzerland	Turkey	..	..	Switzerland

Source: Own elaboration based on OECD Factbook 2015-2016.

Investment funds shares (Table 5) are the most popular in Canada which created the first group (I) together with Belgium, USA, Luxemburg, and Spain (in 2014 only). The group (II) that holds the second largest of investment funds shares consists of Austria, Finland, Germany, Hungary, Italy, Slovakia and Sweden in 2008 and 2014, together with France, Spain and Switzerland in 2008, and Denmark in 2014. There are no investment funds shares in Australia, Ireland and Israel for 2008 only (since Israel is not classified in 2014 due to lack of data), which create the last class (IV) together with Estonia (0.4% and 0.8% in both years, respectively) and Turkey in 2014 (there is lack of data for Turkey in 2008). The rest of countries are classified to the third class (III) or not classified as there is no data available.

Table 6
Clustering of countries according to Pension Funds (% of Total financial assets)

Year	2008	2014	
IV class	France	0.0	0.0 France
	Greece	0.4	1.1 Greece
	Luxembourg	2.0	3.2 Luxembourg
III class	Estonia	4.6	3.6 Hungary
	Slovenia	4.9	3.8 South Korea
	Czech Rep.	5.2	4.4 Turkey
	Italy	5.7	5.7 Portugal
	Austria	6.3	6.3 Italy
	Belgium	6.3	6.4 Austria
	Portugal	7.4	6.5 Czech Rep.
	Spain	8.1	6.7 Belgium
	Slovak Rep.	8.4	7.4 Slovenia
	Hungary	10.0	8.0 Spain
	Finland	11.3	8.3 Finland
	Germany	13.1	9.9 Estonia
	Japan	13.8	10.2 Poland
	Poland	15.1	13.9 Slovak Rep.
II class	Denmark	20.2	14.1 Germany
	Ireland	22.0	21.3 Denmark
	Norway	24.1	27.1 Norway
	Sweden	27.5	28.5 Ireland
	Israel	29.4	29.6 Sweden
	USA	32.0	31.2 USA
I class	Switzerland	34.6	48.5 UK
	Chile	41.9	49.8 Chile
	UK	43.3	56.0 Australia
	Netherlands	45.8	56.9 Netherlands
	Australia	50.1	.. Canada
Not classified	Canada	..	.. Israel
	South Korea	..	.. Japan
	Turkey	..	.. Switzerland

Source: Own elaboration based on OECD Factbook 2015-2016.

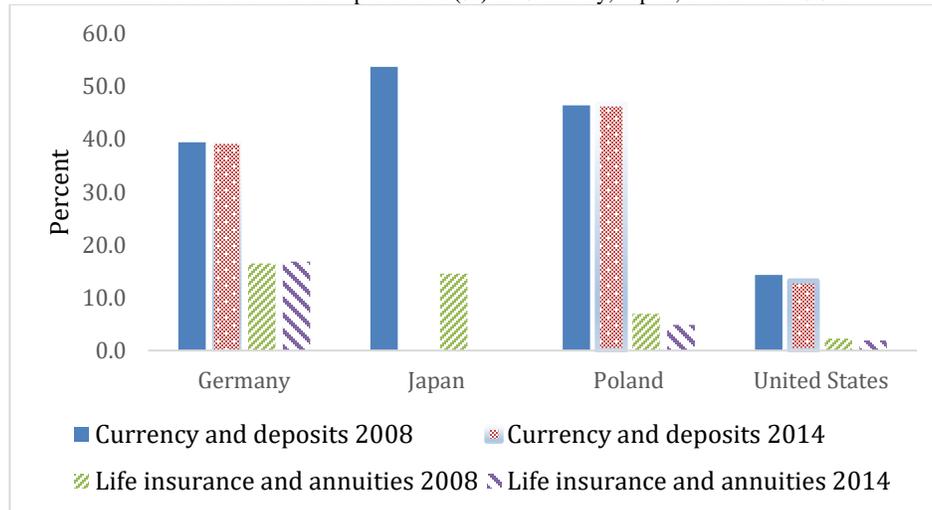
Life insurance and annuities (Table 5) are the most popular of household assets in France and Denmark for both analyzed years, and South Korea in 2014 thus they create

the first class (I). Portugal, UK, Austria, Chile, Belgium, Ireland, and Germany belong to the second class (II) for both years that hold the second largest share of life insurance and annuities assets. Netherlands, Sweden and Japan also belong to this class in 2008, while Luxemburg and Italy in 2014. The smallest share of life insurance and annuities among households' financial assets holdings are observed in Australia where the share equals zero, and in Estonia and USA in both years, together with Greece (2008) and Turkey (2014). These countries belong to the last class (IV).

Pension funds (Table 6) are the most popular in Australia (more than 50.1%), Switzerland, Chile, UK, and Netherlands in the group (I) that holds the largest amount of pension funds. The second group (II) is created by Denmark, Ireland, Norway, Sweden, Israel and USA. The last group (IV) that holds the least amount of pension funds assets consists of France, Greece, and Luxemburg for only 2008.

In summary, it is clear that there is no universal patterns to group the countries by their savings behavior from the type of financial assets held by households in the different OECD countries. However, a look at four significant countries may provide more insights into households' savings behaviors in their financial assets investment: USA, Japan, Germany and Poland. Currency and deposits together with life insurance and annuities are the least popular in the USA in comparison with other countries. The biggest share of currency and deposits in households' portfolios is observed in Japan and Poland, while life insurance and annuities are the most popular in Germany and Japan (Figure 8) with no essential changes in the structure of these investment instruments observed over time.

Figure 8
The share of Currency and Deposits and Life Insurance and Annuities in households' portfolios (%) in Germany, Japan, Poland and USA

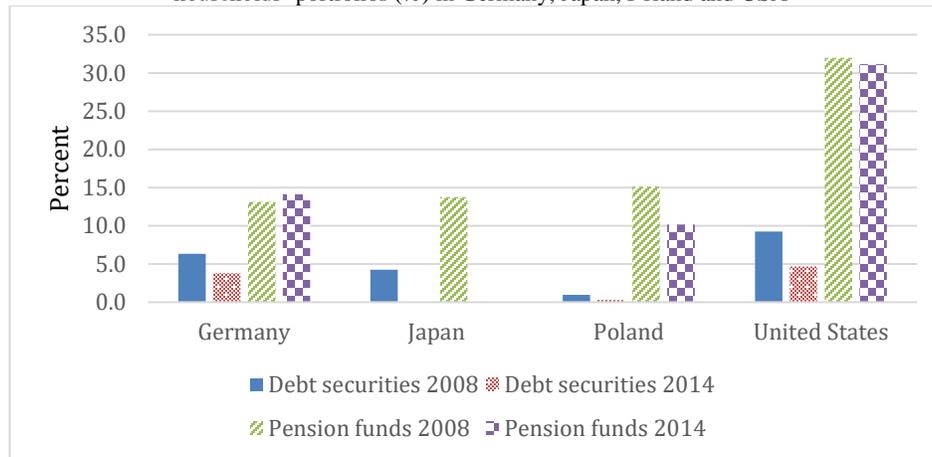


Source: Own elaboration based on Tables 3-6.

Both debt securities and pension funds are the most popular in the USA in the shares of households' pension financial assets holdings while Germany, Poland and Japan have similar comparable levels for 2008 (Figure 9). In 2014, its share increased

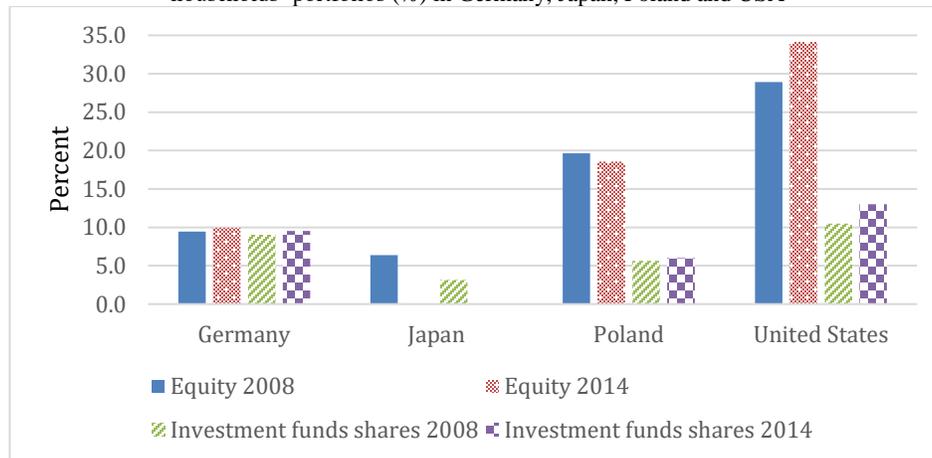
slightly in Germany (7.4%) and decreased in Poland (-33.8%). The share of debt securities in Germany is smaller than in the USA but a little bigger than in Japan while Poland has a bigger share of debt securities. The share of these instruments decreased in 2014 in comparison to 2008 by 40% in Germany, 50% in USA and 70% in Poland.

Figure 9
The share of Debt Securities and Pension Funds in households' portfolios (%) in Germany, Japan, Poland and USA



Source: Own elaboration based on Tables 3-6.

Figure 10
The share of Equity and Investment Funds in households' portfolios (%) in Germany, Japan, Poland and USA



Source: Own elaboration based on Tables 3-6.

Again, U.S. households have the biggest share of equity and investment funds in their financial assets portfolios, Poland keeps the second place for the share of equities, followed by Germany with similar shares of both instruments in both years (Figure 10).

C. Economic Development and Ageing of Society versus Savings

Since the economic development of a country depends on the long-term savings of the households and the level of life cycle, we look at the correlation and regression analysis to find what factors influence the levels and structure of savings the most which will have an impact on capital markets growth.

In the first step, we estimate linear regression functions for the household savings rate and GDP per capita which represents the standard of living. The estimation was made for 24 OECD countries that had less than three missing observations for the period 2002-2014. When a set has missing observations, the whole set is estimated using the last available observation in place of the missing observations. We estimated several versions of regression models:

- for all OECD countries and years (312 observations),
- for all countries and years 2003-2012 i.e. only for the years with complete data sets (240 observations),
- for Europe (the aggregate EU28), Germany, Japan, Poland and USA and the years 2002-2014 (13 observations in each data set),
- for all OECD countries in selected years: 2002, 2003, 2009, 2011, 2012, 2013, 2014 (24 observations for each year).

Table 7

Parameter estimates of regression models

Parameter	OECD countries		EU28		Japan	
	β	α	β	α	β	α
	2002-2014		2003-2012		2002-2014	
estimates	0.1745	-0.4153	0.1800	-0.5569	-0.1943	11.7370
t-Student stat.	6.3141	-0.4368	5.5531	-0.5051	-3.2712	6.2886
R ²	0.1140		0.1147		0.4931	0.5594
r-Pearson	0.3376		0.3387		-0.7022	-0.7479
	USA		Germany		Poland	
estimates	0.0754	1.4928	-0.0385	11.2804	-0.5200	12.1409
t-Student stat.	0.8927	0.3748	-2.0986	16.4711	-4.7915	6.0438
R ²	0.0675		0.2859		0.6761	0.1864
r-Pearson	0.2599		-0.5347		-0.8222	0.4317
	2011		2012		2013	
estimates	0.2460	-3.0654	0.3162	-5.9916	0.2494	-3.7568
t-Student stat.	3.1919	-1.0569	3.9663	-1.9728	2.9393	-1.1430
R ²	0.3165		0.4169		0.2820	0.1870
r-Pearson	0.5626		0.6457		0.5310	0.4325
	2002		2003			
estimates	0.1490	1.4368	0.1428	1.1978		
t-Student stat.	1.0158	0.3602	1.0421	0.3131		
R ²	0.0448		0.0470			
r-Pearson	0.2117		0.2169			

Source: Own calculations. Note: bold numbers denote rejection of hypothesis (about parameter equals zero) at the significance level 0.05.

Table 7 contains the parameter estimates, t-Student statistics, determination coefficient R^2 and Pearson coefficient r . In the models estimated for all considered OECD countries for the years 2002-2014, 2003-2012, 2009 and 2011-2014, the relationship of household saving rates and GDP per capita is significantly positive. In other words, an increase of GDP per capita by a thousand dollar causes an increase of the saving ratio estimated for all OECD countries and years by 0.17%, *ceteris paribus*. Parameters standing for GDP per capita in the models estimated for all countries for years 2002, 2003 and for USA do not significantly differ from zero. The relationship between household saving rates and GDP per capita is significantly negative in the models estimated for EU28, Japan, Germany and Poland.

D. Pension Savings and Capital Market Developments

As the demographics of the elderly in the OECD countries are on an upward trend, and household savings are increasingly channeled through the capital markets, it is important to analyze the assets portfolio of pension institutions and their performance. Therefore, this section analyzes:

- the value of these pension institutions assets,
- total investment of providers of funded and private pension arrangements, as a percentage of GDP and,
- the investment efficiency of these assets.

Table 8
Descriptive statistics of total assets investment of
providers of Funded and Private Pension Arrangements in USD billion

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
Min	0.3	0.0	0.0	0.1	0.1	0.1	0.1	1.3	1.3	1.2	1.3	0.6
Max* (10 ³)	16.3	17.6	13.8	16.1	17.9	18.0	19.9	22.7	23.9	23.8	25.1	19.6
Quartile												
1	13.5	15.1	14.2	15.0	18.0	18.6	20.2	23.4	22.9	21.8	21.5	21.5
Median	70.1	76.2	74.3	94.7	112.4	112.8	130.1	153.6	148.9	132.9	134.9	117.0
Quartile												
3	218.5	241.9	210.0	232.3	253.0	273.2	313.4	346.1	355.3	358.7	376.9	265.3

Source: Own calculations based on data from Table A2. Note: * all values should be multiplied by 10³.

Table A2 shows that financial assets of pension institutions significantly vary for different countries where the biggest value is observed for USA for all years investigated, which stands out significantly, and together with Canada and UK seem to be the leaders. This is followed by Japan, Australia and the Netherlands. Greece, Luxembourg and Latvia have the lowest values in pension funds assets. In Table 8, the median and two other quartiles evaluated for each year and for the average (calculated for each country based on the temporal data) are presented.

However, a comparison of values only provides information about the size of the pension markets in OECD countries. An analysis of the dynamics evaluated for each country is more informative (Table 9). The biggest increase is observed for Greece (using 2009 as a base year), followed by Latvia and Turkey. Portugal, Hungary and Finland experienced a decrease in assets. Poland was developing its pension funds market till

2013 (in 2013 its assets were valued at two and a half times the value from 2006). In 2014 the Polish government transferred more than 50% of the pension funds' assets to the Social Insurance Institution resulting in the general increase in 2016 of 0.7% in comparison to 2006.

Table 9
Percentage increase of total investment of providers of Funded and Private Pension Arrangements for 2016 in comparison to 2006 in OECD countries

Country	Country	Country	Country	Country	Country	Country	Country		
Australia	124.62	Estonia	340.03	Ireland	2.39	Mexico	59.84	Slovenia	132.24
Austria	30.97	Finland	-21.21	Israel	271.75	Netherlands	50.90	Spain	2.57
Belgium	73.92	France	68.61	Italy	137.73	New Zealand	263.62	Sweden	66.20
Canada	53.71	Germany	68.78	Japan	4.99	Norway	57.41	Switzerland	89.21
Chile	97.61	Greece*	1816.17	South Korea	416.10	Poland	0.70	Turkey	775.14
Czech	124.34	Hungary	-57.65	Latvia	928.20	Portugal	-33.43	UK	3.58
Denmark	51.44	Iceland	49.62	Luxembourg	255.56	Slovakia	446.45	USA	53.84

Source: Own calculations. Note: *Dynamics for Greece is calculated in comparison to 2009.

Total investment of pension asset providers of funded and private arrangement of different countries are compared as a percentage of GDP for each country (Table A3). There are seven countries where average assets as a percentage of GDP exceeded hundred percent: Denmark (174.6%), Iceland (137.3%), the Netherlands (137.0%), Canada (131.3%), USA (122.0%), Switzerland (114.5%) and Australia (102.4%). There are four countries with shares below 5%: Greece (0.3%), Luxemburg (2.0%), Turkey (3.0%) and Belgium (4.7%). These differences among countries are caused by three main factors: population, welfare of society and the type of the pension system in the analyzed countries. In many European countries, the pay-as-you-go system still exists and creates satisfactory pension benefits whereas in the USA the pension system is multi-component, financed partly by social security together with private pension plans offered by employers, insurance companies and trade unions. Therefore, the role and development of funded retirement plans in some countries are not as sophisticated as in others.

Table A4 provides information about the efficiency of pension savings performance based on the annual real net rate of investment returns of funded and private pension arrangement of pension funds providers. The biggest annual rate of return was observed in Chile in 2009 (22%) after a negative return of -24.1% in 2008, while the biggest loss was in Ireland in 2008 (-35.7%) for the available data. The average of annual returns for the analyzed countries varied from negative -7.3% for Ireland to 5.3% for Spain and Finland. The 2008 Financial Crisis took a toll on depressing pension funds returns where most of the countries experienced negative annual real net rate of investment returns on both funded and private pension arrangements, with mild recovery by 2015 and 2016.

V. CONCLUSION

Our paper looks at savings behavior choices comparing selected (mainly OECD) countries, their pension funds characteristics due to population aging, and the efficiency of financial assets from the annual real net rate of returns from providers of funded and private pension arrangements. Similar to some studies which investigate and compare different countries, there is no specific trend or pattern as to the baby boomers' savings and investment choice behavior in different countries. This may be due to cultural differences to savings and investment choices and the sophistication of pension funds

markets and asset choices offered. Developed countries like the USA and Sweden tend to save in more sophisticated and risky assets like equities, while a less developed country like Turkey has assets invested more in currency and deposits, together with Greece. The U.S. aging population seems to suggest that savings behavior reflects the hump-shaped pattern, while another country like Japan with the highest aging population seems to exhibit to the contrary and are more risk takers. China and Switzerland seem to be the highest savers based on the arithmetic mean. Savings pattern tends to be more similar for transition countries except for Latvia and Estonia while there is no obvious pattern in the Scandinavian countries. The European countries exhibit a mix of increasing and decreasing savings with no obvious pattern. Similarly, there is no obvious pattern observed based on financial assets choices. The USA and most of the developed countries show a similar, stable savings pattern.

Pension funds efficiency and performance in providing an attractive and stable rate of return for retirees are important factors for long-term investment to support economic growth. The annual net rate of returns on pension savings seem to vary from negative (Ireland) to positive (Chile) during the 2008 Financial Crisis, although by 2016 Ireland has the second highest rate of return of 8.1% after Poland with 8.3% while the rest of the countries have an average return of 3.0%. However, there is an observed upward trend in the growth of financial assets held by households being channeled through investment providers of Funded and Private Pension Arrangements in developed and developing countries as the population ages.

ENDNOTES

1. We also include Greece with data taken from a different source (Figure 4).
2. Data concerning years 2018 and 2019 were predicted.
3. It should be noted that being classified in the first or last class is based on the classification criteria (4a)-(4d) but it does not mean that being in the first class is always the best since it depends on the type of financial assets. For instance, the first class presented in Table 3. contains countries which are characterized by the biggest share of currency and deposits in total financial assets of households.
4. No countries were classified into the fourth group based on our specified criteria.
5. Mexico is an exception since the first observation was missing thus, we repeated the second one. Overall, there were nine data missing in the sample containing 312 observations.

APPENDIX TABLES

Table A1

Household savings rates (% of Disposable income) in the years 2002-2014

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Countries													
Australia	0.0	0.5	1.5	1.1	1.8	4.0	10.0	9.1	10.2	11.2	10.3	9.7	..
Austria	8.9	9.2	9.2	10.7	11.3	12.1	11.9	11.3	9.3	7.9	9.2	7.3	7.8
Belgium	11.0	10.6	8.9	8.5	9.2	9.4	10.0	11.4	8.2	6.6	6.4	5.0	5.1
Canada	2.3	1.7	2.3	1.5	3.5	2.9	3.9	5.1	4.3	4.3	5.0	4.9	3.8
Chile	..	..	..	..	..	..	7.0	12.3	8.8	8.6	9.9	9.7	..
Czech Rep.	6.3	5.7	4.9	6.1	7.8	7.0	6.3	8.5	7.6	5.9	6.2	5.5	5.7
Denmark	1.2	1.8	-2.2	-4.6	-1.7	-3.1	-4.2	0.8	2.1	0.9	-0.0	-0.4	-6.4
Estonia	-9.5	-9.3	-11.0	-10.7	-11.2	-7.3	1.6	6.9	3.3	4.1	1.4	3.9	3.1
France	11.6	10.9	11.0	9.4	9.4	9.8	9.5	10.8	10.4	10.0	9.5	9.1	9.6
Germany	9.6	10.1	10.1	10.1	10.1	10.2	10.5	10.0	10.0	9.6	9.3	9.1	9.5
Greece	..	..	..	..	-3.4	-3.5	-5.6	-4.5	-9.0	-8.2	-8.3	-16.4	..
Hungary	3.1	1.7	4.5	5.7	6.3	2.2	1.5	3.6	3.6	4.1	2.6	3.9	4.9
Ireland	0.0	0.4	1.2	1.9	-0.6	-0.7	6.3	12.2	9.6	7.3	8.5	8.1	..
Italy	9.6	9.1	9.5	9.0	8.4	8.0	7.7	7.0	4.1	3.6	1.8	3.9	3.4
Japan	3.3	2.7	2.3	1.6	1.3	1.1	0.6	2.3	2.1	2.6	1.4	-0.0	..
South Korea	..	..	..	..	..	..	..	..	4.7	3.9	3.9	5.6	..
Mexico	..	10.1	8.6	8.2	9.1	8.4	8.1	8.4	8.8	6.9	6.1	5.4	..
Netherlands	7.9	7.4	6.8	5.7	3.8	3.9	3.7	7.1	4.9	5.8	6.8	7.3	8.2
New Zealand	-6.6	-4.1	-3.8	-5.9	-3.3	-1.0	-1.1	1.1	3.0	1.7	2.2	..	..
Poland	9.0	7.9	4.0	3.0	2.7	2.2	0.8	3.2	3.0	-0.5	-0.5	0.7	..
Portugal	3.9	2.7	2.7	1.8	0.4	-0.8	-1.1	2.7	1.3	-0.9	-0.5	-0.2	-2.3
Slovenia	8.5	6.1	7.1	9.4	11.1	9.4	9.7	7.7	6.1	5.5	3.2	5.7	6.5
Spain	5.2	6.7	5.0	3.2	1.4	-1.0	1.6	7.3	3.7	4.6	2.6	4.2	3.9
Sweden	7.8	6.6	5.8	5.4	6.9	9.4	12.7	12.2	11.0	12.7	15.3	15.1	15.3
Switzerland	15.3	14.8	13.7	14.0	15.8	17.4	16.7	17.1	17.0	17.8	18.5	19.0	..
UK	3.8	2.4	0.5	-0.3	-1.2	-0.7	-0.8	4.0	6.1	3.4	2.9	-0.0	-1.9

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Countries													
USA	5.2	5.0	4.7	2.7	3.4	3.1	5.1	6.3	5.8	6.2	7.9	4.9	5.0
Euro area	8.9	9.0	8.7	7.8	7.1	6.9	7.1	8.5	6.9	6.5	6.0	6.1	6.1
EU 28	7.3	7.2	6.4	5.7	4.9	4.6	5.0	7.4	6.1	5.4	4.9	4.7	4.3
China	31.5	33.9	33.8	35.4	37.2	39.2	39.9	40.4	42.1	40.9	40.7	..	..
Russian Federation	..	..	..	11.0	12.4	12.1	10.1	13.1	15.5	13.8	12.5	10.9	..
South Africa	..	..	..	..	..	..	-1.1	-0.5	-0.8	-1.1	-2.1	-2.5	-2.4
Average*	6.20	6.18	5.65	5.54	5.62	5.69	6.25	8.17	7.22	6.64	6.42	4.98	4.38
Average* OECD	5.11	5.02	4.48	4.07	4.09	4.09	5.09	7.08	5.92	5.39	5.24	5.04	4.78

Source: OECD Factbook 2015-2016 and own calculations denoted by *. Note: for Finland, Iceland, Israel, Latvia, Luxemburg, Norway, Slovakia and Turkey, there was lack of data in all years, symbol .. denotes data not available.

Table A2

Total investment of providers of Funded and Private Pension Arrangements, in USD billion, 2006-2016

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
OECD Countries											
Australia	678.2	1014.3	1095.3	867.4	1017.1	1437.8	1426.0	1482.9	1681.8	1517.6	1523.3
Austria	16.8	19.4	17.5	20.3	20.3	19.1	21.5	25.2	23.3	22.4	22.0
Belgium	17.6	21.8	15.9	19.9	17.8	20.2	22.8	27.2	27.6	26.3	30.6
Canada	1563.9	1993.6	1413.0	1744.8	2085.2	2177.7	2356.5	2427.3	2462.2	2248.5	2403.9
Chile	88.3	111.3	74.3	118.1	148.4	135.0	162.0	163.0	165.4	154.7	174.5
Czechia	7.0	9.2	9.9	11.8	12.4	12.4	14.3	15.0	14.9	15.0	15.7
Denmark	404.0	470.0	501.0	528.9	553.0	581.5	636.2	661.2	655.9	598.6	611.9
Estonia	0.8	1.3	1.3	1.7	1.8	1.8	2.3	2.8	3.1	3.2	3.7
Finland	171.2	209.1	183.2	214.6	219.3	128.7	141.5	159.3	148.9	132.9	134.9
France	136.5	163.0	168.9	222.6	225.9	224.2	241.8	271.4	226.4	212.3	230.2
Germany	132.7	170.4	165.6	187.9	187.3	192.9	221.1	236.9	236.2	218.5	223.9

Greece	..	0.0	0.0	0.1	0.1	0.1	0.1	1.4	1.3	1.2	1.3
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
OECD Countries											
Hungary	12.1	16.0	13.7	18.1	19.0	4.4	5.0	5.5	5.0	4.8	5.1
Iceland	21.6	28.1	14.7	15.5	18.2	18.6	19.9	24.5	24.2	26.7	32.4
Ireland	115.6	127.5	88.4	104.0	100.9	93.5	106.2	126.2	136.5	122.3	118.3
Israel	47.7	58.2	80.8	94.7	112.4	112.8	130.1	153.6	154.3	165.2	177.3
Italy	69.5	87.5	88.4	107.7	113.5	119.9	141.0	163.4	162.9	155.0	165.2
Japan	1290.4	1295.4	1582.0	1548.7	1731.2	1815.9	1675.7	1411.8	1305.9	1324.3	1354.8
South Korea	70.7	76.2	62.3	87.7	161.5	192.2	249.4	292.8	326.9	343.3	364.6
Latvia	0.3	0.6	1.1	1.6	1.8	1.8	2.2	2.7	2.8	2.9	3.3
Luxembourg	0.5	0.6	0.5	1.2	1.1	1.1	1.2	1.3	1.8	1.6	1.7
Mexico	97.9	112.4	98.1	116.9	146.1	142.7	181.6	194.8	195.5	175.9	156.5
Netherlands	884.9	1137.1	932.8	979.4	1015.7	1055.7	1229.1	1335.1	1282.0	1266.4	1335.2
New Zealand	12.4	14.1	15.4	12.4	19.3	23.9	28.4	33.8	39.8	39.5	45.1
Norway	23.4	29.7	21.9	30.3	33.1	33.6	39.5	40.9	37.4	34.2	36.9
Poland	40.8	58.5	47.5	64.1	75.8	67.6	89.2	102.9	47.1	40.5	41.0
Portugal	31.7	37.2	30.5	33.7	28.3	18.5	20.4	22.3	22.5	21.3	21.1
Slovakia	1.7	3.4	4.4	5.7	6.5	7.5	9.0	9.9	9.6	8.7	9.5
Slovenia	1.3	1.8	2.0	2.6	2.8	2.9	3.0	3.2	3.1	2.9	3.0
Spain	160.1	194.8	175.8	192.4	179.6	172.6	180.4	199.6	183.6	168.0	164.2
Sweden	234.2	274.6	236.8	242.1	280.0	322.2	377.4	399.5	383.7	374.1	389.3
Switzerland	478.0	537.9	506.3	581.2	661.2	664.6	734.0	907.7	880.7	892.6	904.4
Turkey	4.0	8.8	9.3	14.5	16.8	28.3	30.2	35.5	41.1	37.2	35.2
UK	2195.1	2266.1	1412.2	1820.7	2018.0	2232.6	2530.0	2810.6	2784.6	2741.9	2273.7
USA	16333.2	17604.2	13844.6	16110.3	17854.6	18029.0	19865.5	22661.5	23865.7	23755.2	25126.6

Source: Pension Markets in Focus, 2017 edition.

Table A3

Total investment of providers of Funded and Private Pension Arrangements, as a percentage of GDP, 2006-2016

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
OECD Countries											
Australia	91.4	109.9	96.5	84.9	92.0	94.9	93.8	104.7	112.3	122.2	123.9
Austria	4.8	4.7	4.3	4.9	5.2	4.8	5.1	5.7	5.8	6.1	6.0
Belgium	4.1	4.3	3.2	4.0	3.6	4.1	4.5	5.0	5.7	5.9	6.9
Canada	122.1	125.2	104.7	116.5	125.6	125.6	128.7	136.1	144.0	156.7	159.2
Chile	57.5	60.8	49.8	61.8	62.3	57.7	59.7	61.9	67.5	69.0	69.6
Czech Republic	4.2	4.4	4.8	5.5	5.9	6.1	6.7	7.3	7.9	8.1	8.4
Denmark	136.0	137.2	147.0	159.4	171.4	180.9	190.0	185.5	203.0	201.7	209.0
Estonia	4.7	5.6	5.6	8.3	9.0	8.4	9.8	10.9	12.9	14.6	16.4
Finland (1)	75.3	76.1	67.9	82.3	87.7	50.5	53.7	56.8	59.7	58.2	59.3
France (2)	5.6	5.7	6.1	8.0	8.5	8.4	8.8	9.3	8.7	8.9	9.8
Germany (3)	4.2	4.6	4.6	5.3	5.4	5.5	6.1	6.1	6.6	6.6	6.8
Greece (4)	..	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.6	0.6	0.7
Hungary (5)	9.6	10.8	9.5	13.0	14.6	3.8	3.9	3.9	4.0	4.1	4.3
Iceland	129.6	127.4	114.1	121.2	129.2	134.0	144.3	150.0	153.4	156.0	150.7
Ireland (6)	47.4	43.9	33.8	42.4	45.1	42.0	45.9	50.7	57.8	42.9	40.7
Israel	29.4	30.5	39.6	43.8	45.7	46.1	48.9	50.3	54.3	55.4	55.7
Italy	3.4	3.7	3.9	4.8	5.3	5.7	6.6	7.4	8.3	8.7	9.4
Japan	29.1	27.8	27.6	29.1	28.2	28.7	29.3	29.5	30.7	30.1	29.4
South Korea	6.8	6.8	7.1	8.9	14.5	16.6	19.4	21.6	24.2	25.7	26.9
Latvia	1.4	1.9	3.1	6.1	7.4	6.9	7.6	8.4	9.8	11.0	12.7
Luxembourg	1.0	1.0	1.0	2.3	2.0	1.9	2.0	2.1	3.0	2.8	2.9
Mexico	10.1	10.7	10.8	12.6	13.6	13.7	15.1	15.8	16.7	16.6	16.7
Netherlands	116.0	126.0	104.9	110.1	120.4	126.9	144.4	148.3	159.3	170.2	180.3
New Zealand	12.4	11.5	10.4	11.6	14.0	15.4	16.3	18.6	19.8	22.9	24.4
Norway	6.6	6.8	5.9	7.2	7.5	7.2	7.4	8.1	8.8	9.7	10.2
Poland (7)	11.1	12.0	10.9	13.3	15.6	14.7	17.0	18.7	9.6	8.8	9.3
Portugal (8)	14.5	14.4	12.2	13.3	11.8	8.1	9.2	9.5	10.7	10.9	10.8

Slovak Republic	2.4	3.6	4.6	6.2	7.2	8.2	9.4	9.7	10.5	10.2	11.2
Slovenia	3.1	3.5	3.8	5.0	5.8	6.0	6.3	6.4	6.8	6.9	7.0
Spain	12.1	12.2	11.3	12.4	12.4	12.5	13.2	14.1	14.6	14.3	14.0
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
OECD Countries											
Sweden	51.9	53.4	54.6	52.4	53.4	60.7	66.6	68.1	75.4	75.5	80.6
Switzerland (9)	108.4	105.6	90.1	102.0	102.5	101.1	107.9	127.5	135.3	137.2	141.6
Turkey	0.7	1.2	1.4	2.2	2.2	3.8	3.4	4.2	4.7	4.6	4.8
United Kingdom	76.8	73.9	61.9	74.0	82.0	88.7	95.7	98.1	97.9	98.8	95.3
United States	117.9	121.6	94.1	111.7	119.3	116.2	123.0	135.8	136.9	131.1	134.9

Source: Pension Markets in Focus, 2017 edition.

Table A4

Annual real net rate of investment returns of Funded and Private
Pension Arrangements in selected OECD and non-OECD countries (%), 2006-2016.

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Selected OECD countries											
Australia	8.9	12.9	-11.4	-10.2	5.6	5.3	0.6	10.3	8.9	7.8	1.9
Austria	3.8	-1.8	-14.4	7.3	3.7	-6.0	5.5	2.9	6.2	1.2	2.6
Belgium	10.3	7.7	-22.3	13.4	4.4	-4.6	9.2	5.8	10.7	3.2	3.7
Canada	10.8	1.0	-16.9	10.3	7.6	1.8	7.9	9.8	7.8	5.1	4.0
Chile	14.4	4.4	-24.1	22.0	8.3	-6.0	5.1	3.5	8.1	1.5	1.5
Czech Republic	1.3	-2.0	-1.6	-0.6	0.7	0.6	0.2	0.2	1.2	1.0	-1.2
Denmark	2.0	-1.9	-3.1	4.5	6.4	6.6	6.4	0.6	11.3	1.8	5.9
Estonia	2.2	-5.4	-32.4	17.0	3.6	-8.0	5.2	1.6	5.0	2.9	1.0
Finland	..	..	..	..	..	..	5.2	6.0	6.2	5.3	4.0
Germany	3.2	1.0	0.5	3.9	3.6	1.0	2.7	2.8	4.4	3.0	..
Greece	..	..	2.3	0.3	-7.8	-5.6	5.0	..	6.5	4.7	4.3
Hungary	1.2	-3.9	-21.7	12.8	4.2	..	7.8	7.0	9.6	3.7	4.8
Iceland	9.0	0.5	-23.2	0.9	1.2	2.1	6.9	4.8	7.1	7.5	-0.3
Ireland	..	-7.3	-35.7	..	..	..	..	..	..	4.5	8.1
Israel	5.7	3.5	-16.3	20.1	7.0	-4.3	7.8	8.4	5.8	4.3	3.7
Italy	2.1	0.3	-5.3	5.3	1.2	-2.8	4.0	3.9	5.7	1.7	2.0
Japan	..	..	..	..	..	..	..	..	..	..	2.3
South Korea	0.6	1.7	-1.5	5.2	2.0	-0.6	2.0	2.0	3.2	2.5	2.0

Latvia	-2.6	-9.5	-21.1	14.3	5.2	-5.9	6.6	2.7	5.1	1.4	0.0
Luxembourg	4.9	-2.5	-11.4	6.5	0.7	-2.3	6.0	1.7	8.3	0.6	3.0
Mexico	5.6	-0.1	-7.8	7.5	6.6	1.2	9.7	-1.5	4.7	-0.8	-0.4
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Selected OECD countries											
Netherlands	6.8	0.6	-17.3	11.5	8.9	4.3	9.5	1.6	15.1	0.9	7.2
New Zealand	8.8	5.0	-5.5	-9.5	10.5	3.1	1.6	9.5	7.2	..	..
Norway	7.4	3.1	-10.6	9.7	5.5	-0.1	6.0	7.9	5.1	1.9	2.0
Poland	13.4	1.5	-17.3	8.9	7.2	-9.1	1.6	2.7	..	-6.1	8.3
Portugal	7.1	5.5	-13.2	11.6	-3.0	-7.3	5.8	4.9	6.9	2.1	0.6
Slovak Republic	..	-0.1	-8.9	1.0	0.0	-3.8	0.4	1.1	3.9	0.8	2.5
Slovenia	..	8.2	4.0	7.3	3.3	-0.4	4.4	2.7	9.7	6.2	6.9
Spain	..	..	-7.9	6.3	-1.7	-1.7	3.4	7.4	7.6	2.1	1.0
Sweden	..	..	..	..	..	-1.0	7.9	6.7	10.6	2.7	4.9
Switzerland	5.3	0.2	-13.8	9.9	2.8	0.6	7.5	5.9	7.2	2.1	3.9
Turkey	1.4	13.2	0.9	17.6	1.9	-10.4	9.6	-7.6	5.6	-6.1	2.1
United Kingdom	10.3	0.9	-15.9	13.4	11.2	8.3	9.0	5.4	5.2	4.7	..
United States	4.8	-0.8	-26.6	9.5	5.5	-4.1	5.2	10.4	3.2	-2.2	2.0

Source: Pension Markets in Focus, 2017 edition.

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