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PENSION FUND MARKETS IN EUROPE. COMPARATIVE ANALYSIS APPLYING SYNTHETIC MEASURE OF DEVELOPMENT

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Abstract. The pension systems in the majority of European states have been reformed because of serious changes in the demographic structure of the populations. Therefore funded pillars have been added to the pension systems. This additional (to pay as you go system) pillar, created by pension funds, is mandatory in some countries. The investments made by the pension funds influence the development of financial markets and affect the situation in national economies. The aim of the paper is comparative analysis of the pension fund markets in selected European states in the years 2000-2013, using the synthetic measure of development.

Keywords: pension funds market, comparative analysis, synthetic measure of development

Population ageing in the majority of European countries is leading to the significant increase of the old-age dependency ratios because it causes the increase in the number of people in retirement relative to the size of the working-age population, and the increase in the number of years that people spend on retirement**.** Therefore essential transformations of the pension systems have been introducing in many European states to make pension systems more financially sustainable. The main ideas of changes in the retirement system consist in heightening the pension age and introducing funded system instead of pay as you go system (PAYG). There are six major pension reform key objectives [OECD 2013, p. 18]. (1) Pension system coverage in both mandatory and voluntary schemes. (2) The financial

sustainability and affordability of pension promises to taxpayers and contributors. (3) Incentives that encourage people to work for longer parts of their lifetimes and to save more while in employment. (4) Adequacy of retirement benefits. (5) Administrative efficiency to minimize pension system running costs. (6) The diversification of retirement income sources across providers (public and private), the three pillars (public, industry-wide and personal), and financing forms (PAYG and funded).

The economic crisis caused reduction in government revenues to finance PAYG public pensions leaving the space for the private pension system development. Founded pillar of the pension systems is created by the private pension funds, which operate in similar way as mutual funds. The most frequent reason given in the public policy debate for a funded system is the apparently superior performance of the capital market in terms of the rate of return on investment it can offer. Indeed, many studies have shown how poor the rate of return on PAYG pension contributions really is (see [Sinn 2000], [Feldstein 1997]).

Pension funds play an important role in financial market and affect the development of national economies because they are one of the main institutional investors. In 2013 assets accumulated by pension funds totaled USD 24.7 trillion (i.e. 26.7% of total assets held by all institutional investors) while assets of public pension reserve funds were USD 5.1. trillion (- 5.5%) [OECD 2014, p. 7].

The aim of the research[1] is comparison of the pension fund markets in selected OECD European states in the years 2001-2013. Analysis is provided in terms of the pension funds performance together with investment dynamics and assets accumulated relative to the size of the national economies, using synthetic measure of development.

PENSION FUNDS IN EUROPE

Ensuring coverage of employees through one or more pension plans is fundamental in fighting income poverty in old age. All OECD countries have set up mandatory or quasi-mandatory pension plans, either public or private, to achieve quasi-universal coverage. However, mostly in low-income countries, there is still a significant share of society not covered by public or national schemes. Policies to diversify and secure savings have taken four main forms [OECD 2013, p. 25]. (a) Voluntary pension plans to improve investment options for workers and increase competition among funds. Canada, the Czech and Slovak, Poland and the United Kingdom have introduced such schemes. (b) Regulations that allow individuals greater choice over the way their retirement savings are invested in private plans. Canada, Estonia, Hungary, Israel, Mexico and Poland, for example, have adopted

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this policy, supported by measures to move people automatically into less risky investments as they get closer to retirement, a policy recommended in earlier OECD analysis. (c) The relaxing of restrictions on investment options to foster greater diversification of pension funds' portfolios. Chile, Finland, Switzerland and Turkey have followed this path, with Chile and the Slovakia allowing pension funds to take larger shares in foreign investments in order to hedge the risk of national default. (d) Action to improve pension funds' solvency rates. Canada, Chile, Estonia and Ireland have introduced stricter rules on investment in risky assets in order to protect pension plans' members more effectively. In Canada and Ireland, state direct intervention has helped financially insolvent funds to recoup losses in their asset values caused by the financial crisis. Finally, Finland and the Netherlands temporarily relaxed solvency rules to allow funds a longer time to recover.

Table 1. Percentage real average net annual and 5-year rate of investment returns generated by pension funds

Country	2008	2009	2010	2011	2012	Average 5-year	Average annual	Year
Austria	-14.4	7.3	3.7	-6	5.5	-1.13	0.62	2002
Belgium	-22.3	13.4	4.4	-4.6	9.3	-0.83	2.04	2002
Czech Rep.	-1.5	-0.6	0.7	0.5	0.2	-0.14	0.65	2002
Denmark	5.1	1.2	7.1	12.1	5.4	6.12	4.79	2002
Estonia	-32.4	14.8	2.1	-8.0	5.2	-5.17	-1.63	2003
Finland	-19.7	14	7.1	-5.2	6.6	-0.19	2.23	2002
Germany	0.5	3.9	3.4	1.0	3.3	2.41	2.52	2002
Greece	2.3	0.3	-7.8	-5.6	5.0	-1.28	-1.28	2008
Hungary	-21.7	12.8	4.2	-0.5	6.8	-0.44	0.93	2002
Italy	-5.3	5.3	1.2	-2.8	4.0	0.40	1.35	2002
Luxembourg	-11.3	6.5	0.7	-2.3	5.0	-0.49	3.21	2005
Netherlands	-17.3	11.5	8.8	4.3	13.5	3.50	3.70	2002
Poland	-17.3	8.9	7.2	-9.1	1.6	-2.27	3.95	2002
Portugal	-13.2	11.6	-3	-7.3	5.8	-1.62	1.59	2002
Slovakia	-8.9	1.0	0.0	-3.8	0.4	-2.33	-1.96	2007
Slovenia	-5.4	4.2	1.8	-1.8	4.5	0.59	0.32	2007
Spain	-9.9	6.9	-2.2	-2.3	3.6	-0.95	-0.95	2008
Switzerland	-13.8	9.9	2.8	0.6	7.5	1.04	1.78	2002
U.K.	-0.9	-0.9	-2.1	-2.5	-1.2	-1.52	-0.53	2002

Source: own calculations on the basis of OECD Global Pension Statistics

In our investigation we employ data from OECD Global Pension Statistics concerning pension funds operating in selected European countries[2]. In fact the in-

[2] Analysis, basing on data from OECD Global Pension Statistics, provided for the pension fund markets in the USA and selected European countries is presented in the paper Foo J., Witkowska D. (2015) Pension Fund Efficiency Performance between US and Europe, discussion paper, presented at International Atlantic Economic Conference, Milan.

vestigation covers 19 countries[3] in the years 2001-2013 however in some analysis it is necessary to shorten the sample because of lack of data. Table 1 contains observations concerning percentage real average net annual rate of investment returns generated by pension funds in the years 2008-2012 since only for these years the observations are available for all considered countries (Table 1). Therefore average annual returns are calculated on the basis of available data and the first year of analysis is presented in the last columns in Tables 1, 3 and 4.

As one can notice, only six transitional countries are represented in the analysis. Let us remind that pension funds in these states started to operate latter than in Western Europe. It is visible that global financial crisis influences the pension funds performance since 5-year real average rates of return evaluated for years 2008-2012 are negative for majority of states while negative average annual rates of returns are observed only in Estonia, Greece, Slovak, Spain and the UK. It worth mentioning that pension funds in United Kingdom were the only ones that did not recovered from the crisis in 2012. While pension funds in Denmark, Germany and Switzerland generated nonnegative returns in the years 2008-2012.

Table 2. Annual real returns from mandatory pension funds in Central and Eastern Europe

States	2002-2007	2002-2012	States	2002-2007	2002-2012
Bulgaria	4.0	0.5	Poland	10.8	6.4
Croatia	5.0	3.2	Russia	-3.1	-2.7
Estonia	3.1	0.1	Romania	n.a.	5.1
Lithuania	3.2	0.8	Slovakia	0.8	-12.0
Latvia	-2.0	1.3	Hungary	4.2	n.a.
Macedonia	2.6	2.4			

Source: [Lewicka-Banaszak 2014]

Analyzing the performance of mandatory pension funds in Central and Eastern Europe one can notice that in Poland the efficiency of pension funds is the highest among European transitional states where this pillar is mandatory (Tab. 2).

The market value of assets accumulated relative to the size of economy is described by pension funds' investment as percentage of GDP. The OECD weighted average asset-to-GDP ratio for pension funds increased from 77.1% of GDP in 2012 to 84.2% of GDP in 2013. The Netherlands reached the highest ratio at 166.3%. Table 3 contains average and variability measures of asset-to-GDP ratio calculated for all years of observations, together with measures of dynamics, evaluated for all available data from the period 2001-2013. There are two countries the Netherlands and Switzerland where pension fund investments exceed the value

[3] There is no available data concerning pension funds performance for France in OECD pension data. We also remove Ireland and Sweden from this analysis because for these states there were only data concerning years 2007, 2008, and 2011, 2012, respectively.

of their GDP[4]. In UK the value of investments is bigger than 70% of GDP, while in Finland it equals 60% of GDP. The smallest share of pension funds' investments in GDP is observed in Greece, Luxemburg and Slovenia. Due to variation coefficient Greece with Slovakia are characterized by the biggest, while Switzerland – the smallest variability among the analyzed countries. In Estonia and Slovakia investments raised the most dynamically (according to annual average increase), while in Belgium and Portugal investments decreased (annually).

Table 3. Pension funds investments in the years 2001-2013 as percentage of GDP

Country	Average	Standard deviation	Variation coefficient	Changes in time - annual average	Year
Austria	4.67	0.71	0.15	5.82%	2001
Belgium	4.33	0.57	0.13	-0.52%	2001
Czech Republic	4.78	1.68	0.35	11.04%	2001
Denmark	37.92	8.85	0.23	3.85%	2001
Estonia	4.41	3.11	0.71	61.29%	2001
Finland	60.68	12.09	0.20	0.19%	2001
Germany	4.7	0.97	0.21	5.03%	2001
Greece	0.03	0.02	0.66	30.37%	2007
Hungary	7.66	3.69	0.48	0.32%	2001
Italy	3.63	1.26	0.35	8.80%	2001
Luxembourg	1.51	0.65	0.43	22.48%	2004
Netherlands	122.36	20.52	0.17	3.81%	2001
Poland	10.86	4.97	0.46	18.46%	2001
Portugal	11.09	1.66	0.15	-1.54%	2001
Slovakia	5.31	3.43	0.65	45.90%	2005
Slovenia	2.24	1.12	0.50	19.66%	2003
Spain	7.38	1.02	0.14	4.61%	2001
Switzerland	106.77	7.74	0.07	1.53%	2001
United Kingdom	78.18	14.04	0.18	3.08%	2001

Source: own calculations on the basis of OECD Global Pension Statistics

Taking into consideration value of investments made by pension funds we analyze only investment dynamics because of lack of the data for some years and countries. Investment dynamic is measured by geometric mean, which is calculated individually for each country due to availability of data (Table 4). This measure describes annual average changes of investment values in all considered states. The biggest dynamics are observed in Slovakia (116% annually) and Estonia (81%). The second group is created by Czech Republic (16%), Poland (27.5%), Greece (28%), Slovenia (31%) and Luxemburg (33%), while the slight decrease of investments is observed in Portugal.

[4] Similar situation is in Iceland, which is not considered in our study.

Table 4. Dynamics of total investment of pension funds [millions of national currency]

Country	2007	2008	2009	2010	2011	2012	Average	Year
Austria	13.15	12.55	14.06	15.22	14.76	16.31	8.97%	2001
Belgium	14.79	11.41	13.80	13.31	15.63	17.24	1.74%	2001
Czech Rep.	167.20	191.71	215.87	232.42	247.51	273.20	16.00%	2001
Denmark	548.98	824.24	718.05	867.88	887.90	913.14	8.74%	2001
Estonia	0.71	0.74	0.95	1.07	1.13	1.48	81.01%	2001
Finland	127.00	112.74	133.07	148.06	143.66	152.75	7.46%	2001
Germany	112.76	117.88	126.36	134.85	149.09	167.57	7.88%	2001
Greece	0.02	0.03	0.05	0.05	0.07	0.09	28.44%	2007
Hungary	2766.27	2567.25	3412.00	3964.53	1060.48	919.05	4.06%	2001
Italy	50.14	53.69	62.51	70.81	76.85	87.64	10.92%	2001
Luxembourg	0.37	0.39	0.84	0.80	0.83	0.90	32.78%	2004
Netherlands	772.45	670.24	679.86	760.12	815.87	960.22	6.93%	2001
Poland	141.35	139.61	181.35	223.01	229.02	274.20	27.50%	2001
Portugal	22.36	20.28	21.92	19.72	13.24	14.47	-0.22%	2001
Slovakia	2.29	3.17	3.97	4.88	5.80	6.82	116.16%	2005
Slovenia	0.63	0.71	0.91	1.09	1.20	1.31	30.73%	2003
Spain	86.48	78.13	85.07	83.99	83.66	86.59	7.48%	2001
Switzerland	605.46	538.52	598.93	621.23	625.29	672.50	3.91%	2001
U.K.	1092.67	927.72	1124.26	1289.07	1444.02	1474.50	6.70%	2001

Source: own calculations on the basis of OECD Global Pension Statistics

METHODOLOGY AND EMPIRICAL RESULTS

Our investigation consists in comparative analysis of the pension funds operating in selected European states taking into account their performance together with investment dynamics and assets accumulated relative to the size of the national economies. We apply the synthetic measure of development [Hellwig 1968]. Let us define the taxonomic measure SMR_i for the *i*-th country:

$$SMR_i = 1 - \frac{q_i}{\overline{q} + 2 \cdot S_q} \tag{1}$$

where q_i is the distance of the *i*-th object (state) from the benchmark:

$$q_i = \sqrt{\sum_{j=1}^{k} \left(z_j^i - z_j^0 \right)^2} \tag{2}$$

evaluated for standardized variables z_j^0, z_j^i that describe the benchmark and the *i*-th investigated state, respectively. The benchmark is defined as the hypothetical object that is characterized by maximal values of stimulants and minimal values of destimulants:

$$z_j^0 = \begin{cases} \min\limits_{i=1,2,\ldots,n} \left\{ z_j^i \right\} & for \quad x_i \in D \\ \max\limits_{i=1,2,\ldots,n} \left\{ z_j^i \right\} & for \quad x_i \in S \end{cases} \tag{3}$$

where for each *j*-th variable: z_j^i - standardized variables, x_j^i, $\overline{x}_j$, S_j^x - observations of for the *i*-th country, average and standard deviation, respectively. *D* and *S* are sets of destimulants and stimulants, respectively. Other symbols denote $\overline{q}$, S_q - the average and the standard deviation of distances q_i, respectively.

The synthetic taxonomic measure *SMR* is evaluated for each country on the basis of the diagnostic variables, and it can be treated as a measure of the pension fund market development in analyzed countries. To compare considered states we construct clusters for selected countries as following:

A. very well developed - efficient pension fund market if $SMR_i \geq SMR + S_{SMR}$,
B. well developed pension fund market if $SMR + S_{SMR} > SMR_i \geq SMR$,
C. developed pension fund market if $SMR > SMR_i \geq SMR - S_{SMR}$,
D. undeveloped - inefficient pension fund market if $SMR_i < SMR - S_{SMR}$,

where *SMR* and S_{SMR} are mean and standard deviation of the measures SMR_i, respectively.

The key question concerns the selection of the diagnostic variables, which are used to evaluate taxonomic measures SMR since changes of the set of these variables may influence the position of states (objects) in the ranking and the country belonging to the certain cluster. Therefore if several sets of diagnostic variables are used it is convenient to generalize the results of investigation either

- making a ranking of states taking into consideration all measures:

$$SMGR_i = \sum_{k=1}^{K} R_{ik} \tag{4}$$

  where R_{ik} is the position of the *i*-th state due to measure SMR_{ik}, where SMR_{ik} is evaluated for the *k*-th set of diagnostic variables or

- evaluating the cluster for states taking into consideration the frequency of being the member of the certain cluster:

$$SMGC_i = \sum_{k=1}^{K} f_{ik} \cdot G_{ik} \tag{5}$$

  where G_{ik} is the scoring for the cluster where the *i*-th state belongs due to measure SMR_{ik}, (we assumed: A=1, B=2, C=3 and D=4), f_{ik} describes how many times the analyzed *i*-th object (state) belongs to certain cluster A-D. Using average and standard deviation of $SMGC_i$ we construct generalized clusters based on all applied sets of variables (as it was made before for SMR_i).

To construct the synthetic measure we use seven diagnostic variables: (1) five-year rates of return (OECD data), (2) annual rates of return (geometric mean evaluated from yearly OECD data), (3) annual average share of the pension funds

investments in GDP (arithmetic mean), (4) standard deviation coefficient of the share of the pension funds investments in GDP, (5) variation coefficient of the pension funds investments in GDP, (6) average annual increase of the share of the pension funds investments in GDP, (geometric mean), (7) average annual increase of the pension funds investments in local currency (geometric mean).

Table 5. Ranking of states due to SMR_i evaluated for different set of diagnostic variables

SMR(Ia) – 7 variables		SMR(Ib) – 4 variables		SMR(IIa) – 6 variables		SMR(IIb) – 5 variables	
Denmark	0.248	Netherlands	0.436	Denmark	0.464	Denmark	0.544
Luxembourg	0.224	Denmark	0.383	Switzerland	0.378	Switzerland	0.466
Switzerland	0.213	Switzerland	0.329	Germany	0.356	Germany	0.391
Germany	0.186	Finland	0.278	Slovenia	0.355	Netherlands	0.388
Slovenia	0.173	Luxembourg	0.257	Italy	0.342	Italy	0.323
Netherlands	0.165	Germany	0.251	Netherlands	0.338	Slovenia	0.321
Poland	0.158	Slovenia	0.221	Czech Rep.	0.322	Czech Rep.	0.312
Italy	0.139	Poland	0.206	Luxembourg	0.320	Luxembourg	0.285
Finland	0.139	Italy	0.190	Slovakia	0.281	U.K.	0.275
Czech Rep.	0.135	Czech Rep.	0.176	Poland	0.269	Poland	0.259
Slovakia	0.133	U.K.	0.171	U.K.	0.264	Austria	0.253
Austria	0.095	Slovakia	0.156	Austria	0.238	Belgium	0.251
Belgium	0.085	Hungary	0.144	Belgium	0.231	Finland	0.248
Greece	0.066	Belgium	0.143	Greece	0.222	Spain	0.239
U.K.	0.060	Austria	0.125	Spain	0.215	Slovakia	0.218
Portugal	0.059	Portugal	0.117	Finland	0.169	Portugal	0.142
Spain	0.057	Greece	0.102	Estonia	0.154	Greece	0.128
Hungary	0.048	Spain	0.083	Portugal	0.085	Estonia	0.088
Estonia	0.028	Estonia	0.038	Hungary	-0.142	Hungary	-0.066

Source: own calculations

Due to availability of data for selected countries the synthetic measures are calculated using the measurement of diagnostic variables, which was made in two ways. The first one employs all available observations i.e. dynamics, means or dispersion for each state are measured for different periods (as in Tables 1, 3 and 4), and the aggregated measure is evaluated using diagnostic variables listed above – this set of variables we denote (I). The second measurement assures the same length of dynamic samples for all states although this length differs for selected variables. Data concerning variables (3)-(6) cover the period 2007-2013, while for variables (2) and (7) observations are available for all states in the period 2008-2012, thus the variable (1) is excluded and this set of variables contains six variables denoted by (II).

Table 6. Ranking of states due to generalized measures

Ranking of states			Frequency of the cluster belonging		Clustering of states		
No.	States	$SMGR_i$			No.	States	$SMGC_i$
1	Denmark	5	Austria	C(4)	A	Denmark	4
2	Switzerland	10	Belgium	C(4)		Switzerland	5
3	Germany	16	Czech Rep.	B(3); C(1)	B	Luxembourg	7
4	Netherlands	17	Denmark	A(4)		Netherlands	7
5	Slovenia	22	Estonia	C(1); D(3)		Germany	8
6	Luxembourg	23	Finland	B(2); C(2)		Slovenia	8
7	Italy	27	Germany	B(4)		Czech Rep.	9
8	Czech Rep.	34	Greece	C(3); D(1)		Italy	9
9	Poland	35	Hungary	C(1); D(3)		Poland	9
10	Finland	42	Italy	B(3); C(1)		Finland	10
11	U.K.	46	Luxembourg	A(1); B(3)		Slovakia	10
12	Slovakia	47	Netherlands	A(1); B(3)	C	U.K.	11
13	Austria	50	Poland	B(3); C(1)		Austria	12
14	Belgium	52	Portugal	C(2); D(2)		Belgium	12
15	Greece	62	Slovakia	B(2); C(2)		Greece	13
16	Spain	64	Slovenia	B(4)	D	Portugal	14
17	Portugal	66	Spain	C(2); D(2)		Spain	14
18	Hungary	69	Switzerland	A(3); B(1)		Estonia	15
19	Estonia	73	U.K.	B(2); C(1); D(1)		Hungary	15

Note: Numbers in parenthesis denote how many times the *i*-th state is classified to the certain class A-D on the basis of taxonomic measures SMR_{ik}.

Source: own calculations

In addition, after correlation analysis of variables for both samples we created sets of uncorrelated variables i.e. variables for which Pearson coefficient is smaller than 0.8. In other words we apply two sets of variables denoted as (a) and (b). The sets containing all variables (i.e. 7 for the sample I and six for the sample II) we denote as (a) and the sets, which contain only uncorrelated variables is denoted as (b). Standard deviation (4) and variation coefficient (5) together with annual changes in the share of pension funds investments in GDP (6) are strongly correlated for the sample (I) thus they are excluded from set of variables (a). While from the sample (II) only variable (6) is excluded from set of variables (a), creating the set (b). Therefore synthetic measures SMR are calculated on the basis of seven variables – SMR(Ia), four variables SMR(Ib), six variables SMR(IIa) and five variables SMR(IIb). According to evaluated taxonomic measures we rank all countries and classified them to the four clusters describing the level of development of the pension markets (Table 5).

The efficient pension systems are in Denmark and Switzerland, while inefficient ones - in Estonia and Hungary. Poland belongs the second cluster i.e. the pension system containing mandatory funded pillar was well developed since in all

four rankings the lowest position of Poland is the 10-th. Among other countries in transition which were taken into account only Slovenia keeps better position in all rankings, and Czech Rep. in rankings provided on the basis of the sample (II), and Slovakia for SMR(IIa). The mentioned relations are even better visible using measures that summarize ranking and clustering for all defined set of variables (Table 6).

CONCUSION

Our paper compares the development of the pension fund markets in selected European states. In our analysis we applied seven diagnostic variables describing the pension fund markets to construct the synthetic measure of development *SMR* for each analyzed country. Diagnostic variables are evaluated using OECD data from the years 2001-2013.

According to our investigation pension fund markets are the most developed in rich countries i.e. Denmark, Switzerland Netherlands, Luxemburg and Germany. However some new European Union member states, namely Slovenia, Poland, Czech Republic and Slovakia keeps high positions in the ranking while the pension fund markets are inefficient in Estonia and Hungary. It is worth noticing that United Kingdom, Austria, Belgium and Spain are classified to the third and fourth classes i.e. pension fund markets are not well developed in these countries.

REFERENCES

Feldstein M. (1997) Transition to a Fully Funded Pension System: Five Economic Issues, NBER Working Paper No. 6149, http://www.nber.org/papers/w6149.pdf.

Foo J., Witkowska D. (2015) Pension Fund Efficiency Performance between US and Europe, discussion paper, presented at International Atlantic Economic Conference, Milan.

Hellwig Z. (1968) Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom ich rozwoju oraz zasoby i strukturę wykwalifikowania kadr, Przegląd Statystyczny, nr 4, 307-326.

Lewicka-Banaszak E. (2014) Pod prąd. Systemy emerytalne w Unii Europejskiej i wybranych krajach OECD, a kierunek zmian w polskich OFE, Biuletyn IGTE, Vol. 1 (1), pp. 12-20.

OECD (2013) Pensions at a Glance: OECD and G20 Indicators, © OECD.

OECD (2014) Pension Markets in Focus, © OECD.

Sinn H. W. (2000) Why a Funded Pension System Is Useful and Why It Is Not Useful, National Bureau of Economic Research, Working Paper 7592, http://www.nber.org/papers/w7592.