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EMPIRICAL APPROACHES UPON PENSION SYSTEMS IN CENTRAL AND EASTERN EUROPEAN COUNTRIES. TRIANGLE ASSESSMENT: FREE MOVEMENT OF PEOPLE, LABOR MARKET AND POPULATION HEALTH FEATURES

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Abstract: Nowadays, around the world, it can be noticed an important trend towards the pension system reforms. The creation of the European fiscal space, the effects of globalization and the movement of the labour force are important vectors towards creating a new type of social economy. The labour force is constantly moving around the countries that gathered important amounts of capital, especially in industrialized countries. Moreover, the lower levels of the birth rate combined with the increasing level of death rate unbalance the labour market. The entire European continent undergoes a demographical transition period, highlighted by aging and intensive migration. This phenomenon is registered both outside and inside the European Union, especially upon the highest industrialized Western countries. In this context, the human capital role and quality gain an important topic throughout the social and economic developments. In this article, we tackle some important aspects regarding the correlation between the actual *status quo* of population structure and some important features of future pension systems.

Keywords: PAYG public pension system, demographic transition, labor market, retirement.

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1. Introduction

Europe, from an anthropological view, is distinguished by the discrepancy between western countries, symbols of multiculturality with economic systems based on free markets and democratic governance systems, and the Central and Eastern European Countries (CEE), part of the former Soviet bloc, with socialist influences that are still found today. However, the social protection of the citizens represented the essential agenda for all countries, regardless of the government type, cultural features, and economic system.

Social protection systems originate in the period of the industrial revolution. Capitalist economic system developed during those times, characterized by the competitivity of capitals (financial resources, material resources, and working capacity) can lead to social inequalities and subsequently towards the occurrence of poverty risk. For this purpose, the state must protect its citizens and ensure their social protection.

Social protection aims to respect the fundamental rights of the population, honoring human dignity, especially in the case of vulnerable groups. Such a category is formed by the people who due to old age or accidents or pathologies cannot perform any professional activity to provide them the needed resources for daily life. As a result, their financial protection is mainly done by national pension systems.

In the literature of the social protection field, it can be identified multiple types of organization and functioning of national pension systems, the most complex being the multi-pillar structure proposed by the World Bank. In CEE countries the multi-pillar structure of national pension systems is based on the public *pay-as-you-go* (PAYG) component. The features of this system consist of inter-generational redistribution, which assumes that the resources collected from the contributions paid by the employed population and from other fiscal payments to the pension fund, will be used to finance the current benefits.

The direct link between the features of the labor market and the PAYG pension systems represents a threat to the financial sustainability of these systems in the current demographic context defined by intensive migration, negative population change, and an aging trend. In this context, the structure and the quality of human capital becomes a very important subject to maintain the socio-economic development of CEE countries.

In this article, we propose an approach based on several aspects regarding the correlation between the real *status quo* of population structure and some important

features of public pension systems from CEE countries. Concretely, we will refer to five countries of CEE, respectively: Czech Republic, Hungary, Poland, Romania, and Slovakia. The conclusions enriched in this paper highlight that it can be identified strong connections between free movement of people, labor market and population health *status.* The pension systems in CEE countries are influenced by the migration phenomenon of their citizens oriented towards several western developed countries, the inflexible labor market in some areas with specific regional disparities and the population health *status* which is established by several underlying factors: social welfare, educational capabilities, medical services access and social framework.

The paper is structured in multiple sections, as following: the first part highlights the connection between the features of labor market and public pension systems of CEE countries; the second part of our work is consecrated to literature review regarding the social protection of elderly; in the third part is presented the background of the study and the evolutions of descriptive data; the fourth part is compound from research methodology used to fundament the study; the fifth part presents and discusses the empirical results, and in the last part are presented the conclusions and final considerations of the article.

2. Literature review

The current configuration of contemporary social protection and pension systems must be understood by a socio-cultural perspective over the framework and the context in which these have been established and developed. The main assumptions which assess the creation of social protection systems are found in several criticizes brought to a capitalist economic system, as encouraging the appearance of social inequalities and poverty. Kaufmann (2012) identified the sociological foundations which establish the basis of initiation of social protection systems, these being presented synthetically in Table 1.

Table 1 Sociological assumption for establishing social protection systems

Promoter	Sustained concept
Lorenz von Stein	Developed the concept of existing tension between civil society, state, and family, arguing the social order.
Adolph Wagner	Sustained the action of the state, through social policies in accomplishing the redistributions in the benefit of citizens from disadvantaged categories.
Hugo Sinzheimer	Approached a judicial view on the labor market and social protection.
Eduard Heimann	Described the connection between cultural development and economic development, promoting the need for social policies

	in the context of capitalism and social inequality.
Hans Achinger	Contributed to the understanding of social policies to the social protection of workers.
Friedrich List	Described the responsibility of the state in establishing the direction and results of economic activities, as so in human capital development.
Alva and Gunnar Myrdal	Explained the connection between demography and social politics, making references especially to the policies aimed to support the family.
Thomas H. Marshall	Promoted social rights as a foundation for social inclusion.
Jean Charles Léonard Simonde (Simonde de Sismondi)	Sustained the responsibility of the state in ensuring a fair distribution of the welfare produced by economic growth.
John Stuart Mill	Encourage the state interventionism to reduce the economic burden of disadvantaged classes and to promote equal opportunities for all citizens.

Source: Authors' synthesis based on Kaufmann (2012)

The development of social protection systems had a clear direction: the respect of the social rights of the population to maintain the economic development and growth of the countries. Abramovitz (1956) points out the quality of the population in the economic growth of a country and Mincer (1958) presents the role of competencies and experiences in obtaining economic benefits. Schultz (1961) states that population health is an essential factor for economic development. In this purpose, Ginsburg (1979) presents the main directions of state action: education, health services, reduction of poverty, social insurances and social assistance services.

International Labor Organization (ILO) defines social protection as a manner to respect the fundamental rights of people, as the right to health care and the right to the financial security of children, elderly and all people with disabilities or pathologies that cannot own incomes (ILO, 2012).

Esping-Andersen (1990) identifies three major forms to organize the social protection systems, namely: the liberal typology where the state intervention is minimal and the accent drops on individual responsibility; conservator-corporative typology, based on social solidarity, specific to continental states where the state organizes and must ensure the social protection of its citizens; and, the social-democratic typology, which promote the universality of the benefits.

Sapir (2006) ranges social protection systems into four categories, accordingly to geographic areas. In author's view, there are four European models of social protection, which are: the Anglo-Saxon model characterized by individual

responsibility and social assistance of last resort; the Nordic model with universal benefits based on equity and equality; the Continental model based on the contributions of employed population; and, the Mediterranean model, alike Continental model but with a more powerful segmentation and conditioning in accessing the benefits.

Flores (2014) sustains the concept of a social protection system in transition. According to the author, this type of social protection system is specific to CEE countries that have experienced the "socialist inheritance" and tried to readjust to the new socio-economic and cultural conditions (Cook, 2010). Inglot (2008) appreciates this type of social protection as being into a "construction process" meanwhile Adascalitei (2012) sees it as inconclusive. The debate related to the existence of this typology of the social protection system was researched by Orosz (2019) by using the hierarchical cluster analysis proved that there is a difference between the social protection systems of CEE countries and the traditional European social protection systems.

Social protection systems have, regardless the manner of organization a positive effect on the older population by reducing the poverty risk (Fiszbein et. *al*., 2014; Arza, 2015; Balteș & Jimon, 2018), diminishing the financial uncertainty and ensuring the wellbeing (Salinas-Rodrigues et. *al*., 2014; Galiani et. *al*., 2016).

Public pension systems are a component of social protection systems, having the purpose to offer financial protection to people that cannot carry out professional activities due to old age, accidents, pathologies or disabilities. In CEE countries the base to establish them was the principles promoted by Otto von Bismarck, namely: contribution and social solidarity, their functioning being made accordingly with the principle of intergenerational redistributions. The form of organization of these systems is known as PAYG pension systems, which succeed to fulfill its purposes only by maintaining the equilibrium between the resources obtained from social contributions and the benefits provided to retirees (Godinez-Olivares et. *al.,* 2015).

In CEE counties can be noted the strong connection between the structure of the labor market and the respect regarding the right for social protection of the elderly trough PAYG public pension system. The mismatch between the employed population that pays social contributions and the number of beneficiaries represents a threat to the budgetary sustainability of PAYG pension systems. From this point of view, demographic forecasts made by Eurostat present an alarming future due to the decreasing of live births, increasing life expectancy and subsequently, a large share of the financially dependent population. On the other hand, the gathering of the adult population with knowledge, abilities and rich experience represents an advantage for growing the productivity of labor force and economic development (Čiutienė & Railaitė, 2015; Goldin, 2016).

The measures suggested by the European Parliament to limit the negative effects of the demographic transition on PAYG public pension systems included increasing the standard age of retirement, restricting anticipate retirement, increasing the employment rate of elderly and encouraging private savings (Eatock, 2015). Even if these measures were regulated by all CEE countries, the socio-demographic changes still represent a challenge for PAYG pension systems and express the need for more comprehensive reform harmonized with the educational system, labor market, tax system and financial markets (Balteș *et. al*., 2018). Moreover, the population groups which encompass relatively low incomes, located in disadvantaged geographic areas or working in conditions with high susceptibility for accidents and professional illness might be discriminated by some of the measures promoted and applied by European countries (European Actuarial Consultative Group, 2012).

Consequently, regardless of typology, social protection systems have the purpose to offer protection against social risks for all peoples, no matter age, citizenship, religion, ethnicity or race. Pension systems, as part of social protection systems aimed to provide financial protection of old age people, and also for people suffering accidents or illnesses, have to reshape to fulfill their objectives and stand up to the new socio-demographic challenges.

3. Descriptive data evolution and assessment

Demography of CEE countries (Figure 1) highlights the decrease of live births between 1960-2018 with 47% in Romania, 42% in Poland, 36% in Hungary and 35% in Slovakia, the Czech Republic recording the smaller reduction of live births with 12%. The main cause of these trends is the decreased fertility rate once with socio-economic development and the integration of women in the educational system and on the labor market (Pradhan, 2015). Even if the mortality rate increased in all five CEE countries and especially in Poland (+85%), Slovakia (+72%) and Romania (+64%), the natural change of population has a falling trend, in 2018 having negative values in Hungary, Poland and Romania.

The population structure by age groups reveals the increasing share of the population aged over 65 years old and the decreasing share of all other age groups. In 2018, compared with 1960, the share of population aged until 14 years is reduced in Slovakia and Poland with 12%, in Romania with 10%, in Hungary with 7% and in the Czech Republic with 6%. Also, the population aged between 15 and 39 years old record a reduction, meanwhile the population aged between 40 and 64 years old succeed to maintain a positive trend. This structure led to the growth of the mean age of the population in all five CEE countries with values included between 8.5 years (in case of Hungary) and 12.3 years (in case of Poland), and also

to the rise of old dependency ratio. Compared with 1960 the old dependency ratio indicates the largest increase in Romania (+15%) and Poland (+13%).

An important factor for the demographic characterization of CEE countries is migration. The creation of European space and the community freedoms made felt its effects upon CEE countries, which besides the benefits of foreign investments, are facing the effects of globalization and labor force migration to western countries with developed economies. The migration balance shows a negative net migration in all CEE countries, but it is highlighted the situation of Romania, which in the last decade lost by migration on average 58,000 persons/year.

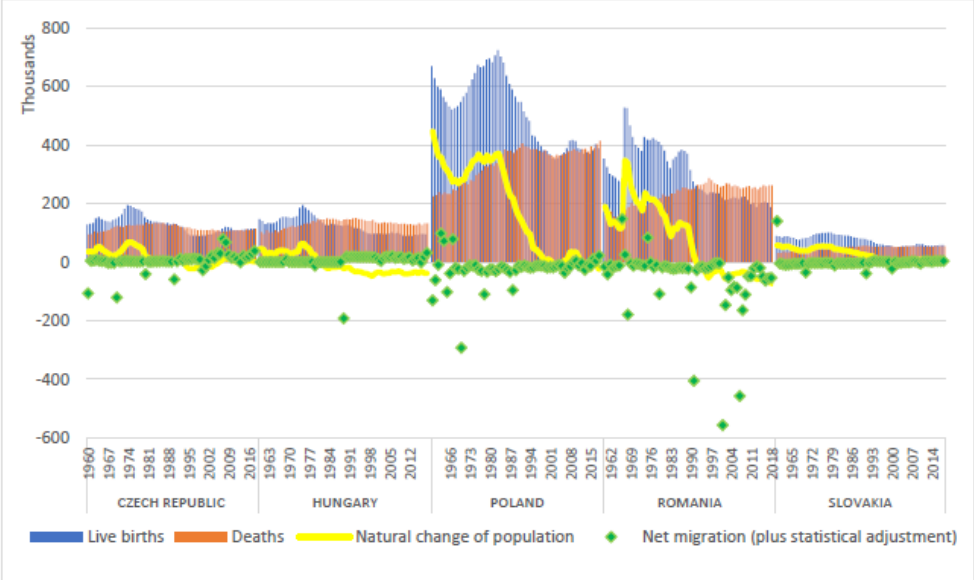

Figure 1 Live births, deaths, natural change of population and net migration in ECE countries between 1960 and 2018

Source: Own processing based on data published by Eurostat

The population of a country, from the perspective of the labor market, is usually classified into two large categories, which are: active population, formed by employed and unemployed population, and inactive population. In CEE countries beginning with 1999 over 65% of the total population can be identified as an active population. The share of population aged between 15 and 64 years employed on the labor market increased in the last 10 years in all five CEE countries, the largest growth being recorded by Hungary and Poland (+11% of the total population) and the smaller by Romania (5% of the total population). At the same time, the share of

unemployed population in the total population decreased, especially in Poland (-5% of total population and -9% of active population) and in Slovakia (-3.2% of total population and -5.4% of active population), Romania achieving a reduction by only 2.3% of active population.

Employed population in all five CEE countries between 2006 and 2017 present a distribution by gender formed in the proportion of 55% by males. Distribution by educational attainment level shows the predominance of the employees with secondary education (between 60% and 71% of employed population), the decrease of the share of population with primary education and the increase of the share of population with tertiary education, especially, in case of females, in all five CEE countries.

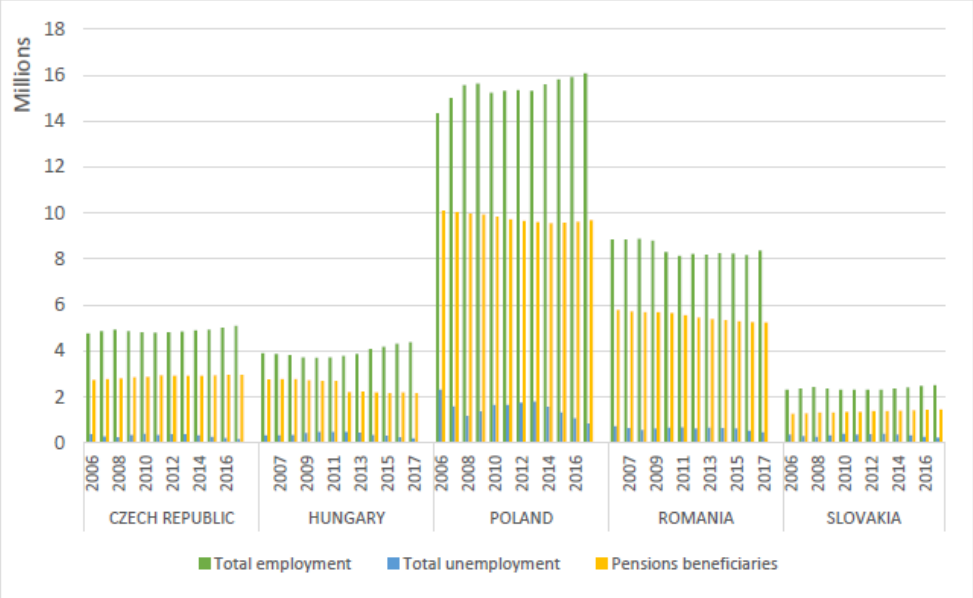

Figure 2 Total employment, total unemployment and pensions' beneficiaries in ECE countries between 2006 and 2017

Source: Own processing based on data published by Eurostat

Organization for Economic Cooperation and Development (OECD, 2018) highlights the role of education in the sustainable socio-economic development of a country. A superior level of education supposes a higher level of competences in the field of specialty. This fact is oriented towards an increased employment rate and reduced unemployment rate, and also in bigger incomes, compared with people

with a lower educational attainment level. From the perspective of social protection systems, the expenditures with unemployment benefits will decrease, and also, the incomes from social contributions will increase. On the other hand, it was noted that people with higher educational attainment levels are more involved in socio-cultural life and have concerns regarding maintaining heath, healthy and balanced lifestyle, personal development and environment protection.

The human capital of a country is not only defined by knowledge, skills, and abilities resulted from the educational process, but also include motivation, creativity and experiences, and also the health status of the individuals (Luthans *et al*., 2004; OECD, 2011). Regarding the health *status* of the population from CEE countries, it can be noted the increase of life expectancy at values up to 76 years in the case of males and up to 82 years in the case of females. Even so, healthy life years decrease to 55 years. In the case of people aged over 65 years, life expectancy in the case of males has values included between 14 and 16 years, and in the case of females this indicator is included between 18 and 20 years, but healthy life years are at most 50% of this time.

An important category of the inactive population is represented by retirees (Figure 2). In CEE countries, the number of beneficiaries of public pension systems between 2006 and 2017 decreased in Hungary (-21%), Romania (-10%) and Poland (-4%), meanwhile in the Czech Republic and Slovakia their number increased with 8%, respectively 14%. Compared with the number of employed people, beneficiaries of the public pension system present a closely constant evolution in the Czech Republic and Slovakia (a share of 58%), in Romania and Poland being recorded a slight decrease of 4%, respectively 10% of employed people. Hungary presents the greatest reduction of the share of beneficiaries of the public pension system in the employed population (-21%), the explication lies in canceling the possibility of anticipating retirement beginning with 2011.

4. Research methodology

The purpose of this article is to highlight some important aspects regarding the correlation between the structure and the quality of population and some features of PAYG public pension systems established by CEE countries. The paper regards the specific situation of five CEE countries, namely: the Czech Republic, Hungary, Poland, Romania, and Slovakia.

The objective of this study is to evaluate and assess the developments of the five CEE pension systems. The five CEE countries have similarities and common social, economic, financial and structural features, mainly due to the communist era and the post-communist developments. These countries are in the *catching-up* process towards the economic *agenda* of the industrialized countries. At the EU

level, it can be noticed a strong decrease in the population level, a decrease in the natural birth ratio and an increase at the mortality rate. Altogether, in this paper, it is highlighted some important measures which the five CEE countries must undertake to strengthen the social and insurance systems.

The purpose of the research is the establishment of the role of human and intellectual capital upon the structure of pension systems by underlying several antithesis phenomena: globalization *versus* glocalization, aging *versus* migration, birth rate *versus* death rate, social economy *versus* capital economy.

For this purpose, it was constructed a database filed by Eurostat data features and composed by the following macroeconomic variables for the time period 2007 and 2017:

- Demographic indicators: average population (AV), live births (LB), deaths (DTS), net migration (NMG);
- Health status indicators: healthy life years (HLY) and life expectancy (LE);
- Labor market indicators: active population (ACT), total employment (EMP), duration of working life (DWL) and unemployment (UNEMP);
- Pension system indicators: number of beneficiaries (BEN) and pension expenditures (EXP).

Therefore, AV represents the arithmetic mean of the number of people at 1st January in two consecutive years, LB means the number of children born that showed a sign of life, excluding the stillbirths and DTS expresses the permanent disappearance of life, respectively the cessation of vital functions and the inability of resuscitation, afterlife birth. NMG, usually knew as the difference between inward and outward migration, is calculated by Eurostat as the difference between total population change and NCP.

HLY shows the number of remaining years expected to live by a person without any severe or moderate health problems, meanwhile, the mean number of years that a person may still be alive represents LE. LEf and LEm represent females' and males' life expectancy.

ACT includes employed and unemployed people, excepting the categories of economically inactive people: pre-school children, school children, students, and pensioners. EMP is defined as all persons who work at least one hour for a payment or were in a temporary leave from such a work, during the reference week; EMPed1, EMPed2 and EMPed3 represent the employment by educational attainment level divided into three subcategories: (1) less than primary and lower secondary education, (2) upper secondary and post-secondary non-tertiary education, (3) tertiary education. DWL measures the number of years a person is expected to be active in the labor market. UNEMP stands for all persons aged between 15 and 74 years old who were not employed, had actively sought for work

or were ready to begin working. BEN shows the number of recipients of one periodic cash benefit from a pension scheme and EXP reveals the expenditures with the pension benefits.

The method used is Pooled Least Squares using EViews 10 University Edition software package. To highlight some important features in each country upon another country of the five CEE's it is used the *Fixed effects estimation* technique.

The regression equations used in the research are the following:

$$AV_{it} = \alpha + \beta_1 xLB_{it} + \beta_2 xNMG_{it} + \beta_3 xDTS_{it} + \varepsilon_{it} \quad (1a)$$

$$AV_{it} = \alpha + 2.88xLB_{it} - 2.18xNMG_{it} - 0.27xDTS_{it} + \varepsilon_{it} \quad (1b)$$

$$DWL_{it} = \alpha + \beta_1 xACT_{it} + \beta_2 xEMPed1_{it} + \beta_3 xEMPed2_{it} + + \beta_4 xEMPed3_{it} + \beta_5 xEMP_{it} + \beta_6 xUNEMP_{it} + \varepsilon_{it} \quad (2a)$$

$$DWL_{it} = \alpha - 0.03xACT_{it} + 0.13xEMPed1_{it} + 0.12xEMPed2_{it} + + 0.12xEMPed3_{it} - 0.09xEMP_{it} + 0.03xUNEMP_{it} + \varepsilon_{it} \quad (2b)$$

$$BEN_{it} = \alpha + \beta_1 xLEf_{it} + \beta_2 xLEm_{it} + \beta_3 xHLYf_{it} + \beta_4 xHLYm_{it} + + \beta_5 xEXP_{it} + \varepsilon_{it} \quad (3a)$$

$$BEN_{it} = \alpha + 165.60xLEf_{it} - 127.67xLEm_{it} + 136.10xHLYf_{it} - -165.56xHLYm_{it} - 0.01xEXP_{it} + \varepsilon_{it} \quad (3b)$$

Where:
α – free coefficient.
ε_{it} – regression error.
AV – average population.
LB – live births.
NMG – net migration.
DTS – deaths.
DWL – duration of working life.
ACT – active population.
EMPed1 – employment at the education level 0 – 2.
EMPed2 – employment at the education level 3 – 4.
EMPed3 – employment at the education level 5 – 8.
EMP – employment.

UNEMP – unemployment.
BEN – pension beneficiaries.
LEf – life expectancy females.
LEm – life expectancy males.
HLYf – healthy life years females.
HLYm - healthy life years males.
EXP – pension expenditures.

5. Results and discussions

The results of the three equations used in this study are presented in tables no.1, no.2 and no.3. According to table no.1, the empirical results show that a strong statistical significance degree of the first model. In this sense, it can be identified that the average population is directly correlated with live births and negatively correlated with death and net migration. This result reveals that the live births rate will lead to an increase in the average population, meanwhile, an increase in the net migration level and in death rate will lead to a decrease in the average population in the long run.

Table 1 Empirical results – the impact of live births, migration and deaths upon average population – Pooled Least squared – Fixed Effects

Dependent Variable: AV?				
Method: Pooled Least Squares				
Date: 02/04/20 Time: 14:26				
Sample: 2007 2017				
Included observations: 11				
Cross-sections included: 5				
Total pool (balanced) observations: 55				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16326.21	1058.247	15.42760	0.0000
LB?	2.881321	2.573061	1.119803	0.2700
NMG?	-2.183688	0.317593	-6.875745	0.0000
DTS?	-0.271131	4.953904	-0.054731	0.9566
Fixed Effects (Cross)				
CZ --C	-6076.112			
HU --C	-6594.175			
PL --C	20684.11			
RO --C	3053.450			
SK --C	-11067.27			
Fixed Effects (Period)				
2007—C	2.406009			
2008—C	50.66270			
2009—C	40.55597			

2010—C	30.75867			
2011—C	41.61181			
2012—C	33.57726			
2013—C	34.01557			
2014—C	-8.464027			
2015—C	-42.33162			
2016—C	-83.56307			
2017—C	-99.22927			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
Root MSE	97.86634	R-squared		0.999930
Mean dependent var	16796.75	Adjusted R-squared		0.999897
S.D. dependent var	11765.84	S.E. of regression		119.3202
Akaike info criterion	12.65963	Sum squared resid		526780.1
Schwarz criterion	13.31657	Log likelihood		-330.1398
Hannan-Quinn criterion.	12.91367	F-statistic		30883.95
Durbin-Watson stat	0.384241	Prob(F-statistic)		0.000000

Source: Own processing using *EViews 10 Academic Edition* software.

Table no. 2 presents the impact upon the duration of working life by activity, employment and unemployment. The results of the empirical tests highlighted in table no. 2 reveal a strong negative correlation between duration of working life and activity and overall employment and a significant positive correlation with unemployment and employment structured by the educational attainment level.

Table 2 Empirical results – the impact of the active population, employment and unemployment upon the duration of working life – Pooled Least squared – Fixed Effects

Dependent Variable: DWL?				
Method: Pooled Least Squares				
Date: 02/04/20 Time: 14:10				
Sample: 2007 2017				
Included observations: 11				
Cross-sections included: 5				
Total pool (balanced) observations: 55				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.94881	2.786918	5.363920	0.0000
ACT?	-0.034571	0.008439	-4.096586	0.0002
EMPED1?	0.130096	0.112666	1.154700	0.2563
EMPED2?	0.128834	0.112378	1.146428	0.2596
EMPED3?	0.127462	0.112464	1.133364	0.2650
EMP?	-0.091565	0.112131	-0.816590	0.4198

UNEMP?	0.034775	0.008255	4.212410	0.0002
Fixed Effects (Cross)				
CZ_--C	7.422369			
HU_--C	5.766781			
PL_--C	-19.98933			
RO_--C	-5.264683			
SK_--C	12.06486			
Fixed Effects (Period)				
2007—C	-1.560552			
2008—C	-1.477812			
2009—C	-0.810162			
2010—C	-0.560547			
2011—C	-0.250726			
2012—C	0.173660			
2013—C	0.486910			
2014—C	0.616367			
2015—C	0.877653			
2016—C	1.121547			
2017—C	1.383663			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
Root MSE	0.308388	R-squared		0.964583
Mean dependent var	32.46364	Adjusted R-squared		0.943749
S.D. dependent var	1.653768	S.E. of regression		0.392229
Akaike info criterion	1.248723	Sum squared resid		5.230685
Schwarz criterion	2.015159	Log likelihood		-13.33987
Hannan-Quinn criterion.	1.545110	F-statistic		46.29914
Durbin-Watson stat	0.508486	Prob(F-statistic)		0.000000

Source: Own processing using *EViews 10 Academic Edition* software

According to the table no. 3, the empirical results reveal a strong positive correlation between pension beneficiaries and life expectancy, respectively healthy life years of females and a significant negative correlation regarding pension beneficiaries and life expectancy of men, respectively healthy life years of males and pension expenditures.

Table 3 Empirical results – the impact of life expectancy, healthy life years and pension expenditures upon pension beneficiaries – Pooled Least squared – Fixed Effects

Dependent Variable: BEN?				
Method: Pooled Least Squares				
Date: 02/04/20 Time: 14:18				
Sample: 2007 2017				
Included observations: 11				
Cross-sections included: 5				
Total pool (balanced) observations: 55				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1987.633	13601.91	0.146129	0.8847
LEF?	165.6038	179.1781	0.924241	0.3617
LEM?	-127.6749	121.8514	-1.047792	0.3019
HLYF?	136.1053	38.92608	3.496506	0.0013
HLYM?	-165.5638	52.22506	-3.170199	0.0032
EXP?	-0.003228	0.012147	-0.265759	0.7920
Fixed Effects (Cross)				
CZ_--C	-1324.597			
HU_--C	-2010.360			
PL_--C	5016.999			
RO_--C	1298.402			
SK_--C	-2980.444			
Fixed Effects (Period)				
2007—C	13.95723			
2008—C	-98.23053			
2009—C	4.363808			
2010—C	28.55607			
2011—C	59.05640			
2012—C	-25.56400			
2013—C	17.31781			
2014—C	-12.91594			
2015—C	-42.47056			
2016—C	22.22512			
2017—C	33.70460			
	Effects Specification			
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
Root MSE	108.0469	R-squared		0.998708
Mean dependent var	4384.560	Adjusted R-squared		0.998007
S.D. dependent var	3033.873	S.E. of regression		135.4440
Akaike info criterion	12.93028	Sum squared resid		642077.4
Schwarz criterion	13.66022	Log likelihood		-335.5827
Hannan-Quinn criterion.	13.21255	F-statistic		1424.145
Durbin-Watson stat	0.850776	Prob(F-statistic)		0.000000

Source: Own processing using *EViews 10 Academic Edition* software

6. Conclusions and final considerations

Social protection systems, regardless of the typology, have the purpose to offer protection against social risks for all peoples, no matter age, citizenship, religion, ethnicity or race. Pension systems are a part of social protection systems aimed to provide financial protection for old age people, for people suffering accidents or illnesses and as a result, cannot carry on professional activities.

The pension systems established by CEE countries have a multi-pillar structure, but the main compound is the PAYG public pension system. The fundamental principles of PAYG pension systems are social solidarity, intergenerational redistribution and contribution payment. The direct link with the labor market and population structure features, in the new demographic context, represents a threat to the sustainability of public social insurance budget.

The current configuration of social protection systems can be pictured as a bridge between past and future, keeping the process of adjusting to the new socio-cultural values of the population in a globalized framework. The PAYG public pension systems established by CEE countries have to reshape in order to fulfill their objectives and stand up to the new socio-demographic challenges.

The empirical results presented in this study for the five CEE countries have conducted to the following final considerations: the average population level of a country can be maintained or increased by reducing the migration outflow and death rate and by increasing the live births throughout conferring some fiscal and social benefits for young people in order to start a family and give birth for minimum replacement rate; the duration of working life can be increased by offering a high quality of employment force, by reducing unemployment rate and can be consolidated by strengthened the activity of employees, by offering different social and financial stimulations to the employed population; the number of pension beneficiaries can be increased by longer life expectancy and healthy life years of females due to their medical structure and by consolidation of healthy *status quo* of males and life expectancy, respectively the soundness of the pension expenditures.

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Author Contributions

This study is the independent work of the authors, from the conception of the topic to the literature review, data collection, and analysis. The authors participated equally in the making of this paper.

Disclosure Statement

The authors declare no conflict of interest.

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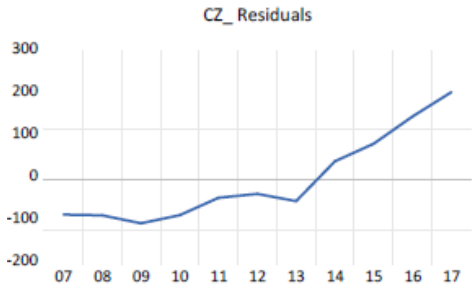
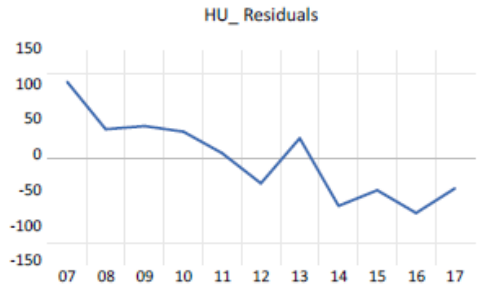
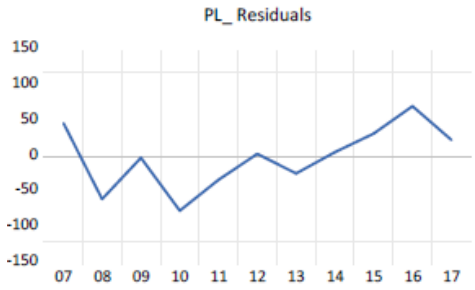
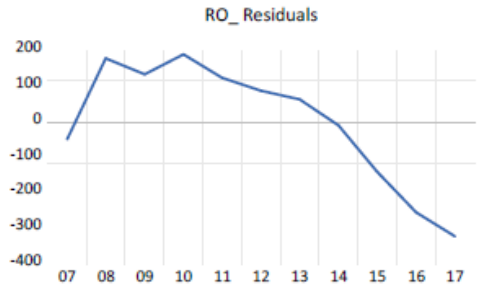
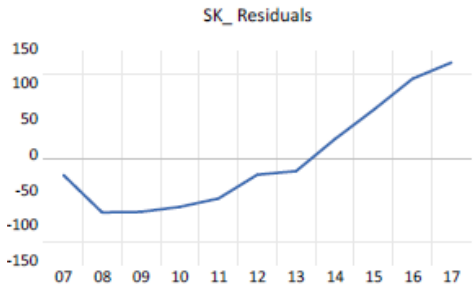
Appendix 1 – Residuals – Pooled Leased Square – Fixed Effect – Equation 1



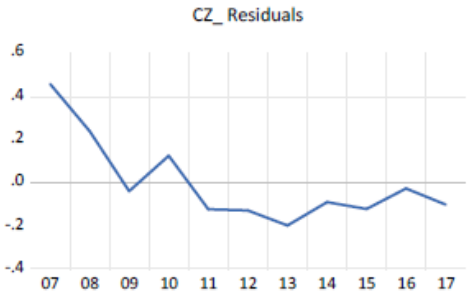


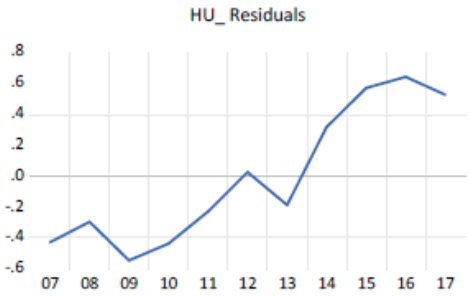


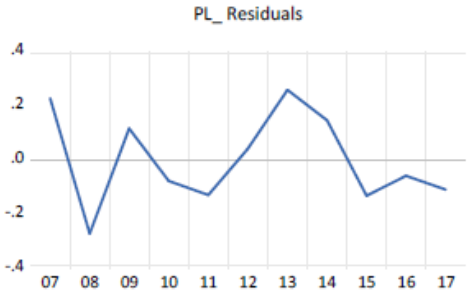


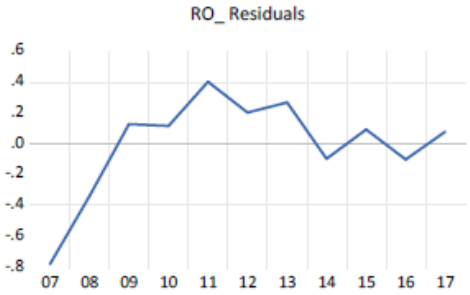


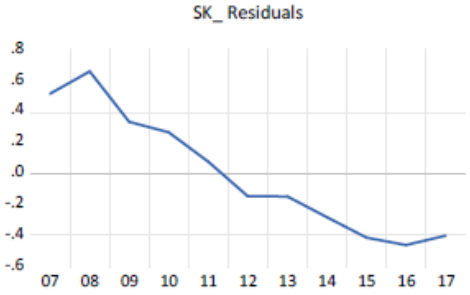
Appendix 2 – Residuals – Pooled Leased Square – Fixed Effect – Equation 2











Appendix 3 – Residuals – Pooled Leased Square – Fixed Effect – Equation 3