# WHAT ARE THE EFFECTS OF ACTIVE AGEING ON GDP PER CAPITA?

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**ABSTRACT**
*Active ageing is a global phenomenon with high influences on GDP per capita evolution. In this context, the aim of our paper is to explain what are the effects of active ageing on GDP per capita in 2006-2016 period. The analysis is carried on panel data and the models are estimated using 9 dependent variables: employment rate of older workers, relative median income ratio, life expectancy, self-reported unmet needs for dental examination, at least upper secondary educational attainment, participation rate in education and training, healthy life years and life expectancy, material deprivation rate, and at risk of poverty rate. The empirical findings led to the conclusion that the variables which are statistic significant and influencing the GDP per capita are employment rate of older workers for men and total, material deprivation rate, and relative median income ratio.*

**KEYWORDS:** *active ageing, GDP per capita, panel data analysis*

## 1. INTRODUCTION

Active ageing is a phenomenon that requires many critical analyzes. According to World Health Organization's - WHO (2002), one of the definitions given to active ageing is: "the process of optimizing opportunities of health, participation and security in order to enhance quality of life as people age. It allows people to realize their potential for physical, social, and mental well-being throughout the life course and to participate in society according to their needs, desires and capacities, while providing them with adequate protection, security and care when they require assistance. Active ageing aims to extend healthy life expectancy and quality of life for all people as they age, including those who are frail, disabled and in need of care." Another dimension of active ageing is represented by the ability of ageing people to lead healthy, independend and secure lives, to continue staying active, involve a dynamic social life and the participation in the labour market. The elderly people are precious but still underestimated resources for society and social development. They contribute to the social well-being as workers-payed or volunteered, to the care of their children and grandchildren, to older adults, or they may have political participation. Given them good health condition, high experience and know-how achieved along working lives may directly contribute to the economic and social development of the society.
According to Eurostat, last year the older people of EU-28 had an increase of 0.2 percentage points compared with the previous year and an increase of 2.4 percentage points compared with 10 years earlier (see Table 1). Across the EU countries Italy (22.3%), Greece (21.5%) and Germany (21.2 %) had the highest increase in elderly population in 2017.

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**Table 1. The evolution of population age structure in EU countries as % of total population in 2007-2017 period**

Population age structure by major age groups, 2007 and 2017
(% of the total population)

| | 0–14 years old | | 15–64 years old | | 65 years old or over | |
|---|---|---|---|---|---|---|
| | 2007 | 2017 | 2007 | 2017 | 2007 | 2017 |
| EU-28 (¹) (²) | 15.9 | 15.6 | 67.1 | 64.9 | 17.0 | 19.4 |
| Belgium (¹) | 17.0 | 17.0 | 66.0 | 64.6 | 17.1 | 18.5 |
| Bulgaria | 13.2 | 14.1 | 69.1 | 65.2 | 17.6 | 20.7 |
| Czech Republic | 14.4 | 15.6 | 71.1 | 65.7 | 14.5 | 18.8 |
| Denmark | 18.6 | 16.7 | 66.1 | 64.3 | 15.3 | 19.1 |
| Germany (¹) | 13.9 | 13.4 | 66.3 | 65.4 | 19.8 | 21.2 |
| Estonia (¹) | 14.9 | 16.2 | 67.9 | 64.4 | 17.3 | 19.3 |
| Ireland (¹) | 20.3 | 21.1 | 68.9 | 65.4 | 10.8 | 13.5 |
| Greece | 14.7 | 14.4 | 66.7 | 64.0 | 18.6 | 21.5 |
| Spain | 14.6 | 15.1 | 68.9 | 66.0 | 16.5 | 19.0 |
| France (¹) | 18.5 | 18.3 | 65.2 | 62.5 | 16.3 | 19.2 |
| Croatia (²) | 15.6 | 14.5 | 66.7 | 65.8 | 17.7 | 19.6 |
| Italy | 14.1 | 13.5 | 65.7 | 64.1 | 20.1 | 22.3 |
| Cyprus | 18.9 | 16.3 | 68.8 | 68.1 | 12.4 | 15.6 |
| Latvia | 14.2 | 15.6 | 68.4 | 64.6 | 17.4 | 19.9 |
| Lithuania | 16.0 | 14.8 | 67.3 | 65.9 | 16.6 | 19.3 |
| Luxembourg (¹) | 18.3 | 16.2 | 67.7 | 69.5 | 14.0 | 14.2 |
| Hungary (¹) | 15.2 | 14.5 | 68.9 | 66.8 | 15.9 | 18.7 |
| Malta | 16.6 | 14.1 | 69.5 | 67.0 | 13.9 | 18.8 |
| Netherlands | 18.1 | 16.3 | 67.4 | 65.2 | 14.5 | 18.5 |
| Austria | 15.6 | 14.4 | 67.5 | 67.1 | 16.9 | 18.5 |
| Poland (¹) | 15.8 | 15.1 | 70.8 | 68.3 | 13.4 | 16.5 |
| Portugal | 15.7 | 14.0 | 66.7 | 64.9 | 17.5 | 21.1 |
| Romania | 16.9 | 15.6 | 68.4 | 66.6 | 14.7 | 17.8 |
| Slovenia (¹) | 14.0 | 14.9 | 70.1 | 66.2 | 15.9 | 18.9 |
| Slovakia | 16.2 | 15.5 | 71.8 | 69.5 | 12.0 | 15.0 |
| Finland | 17.1 | 16.2 | 66.5 | 62.8 | 16.5 | 20.9 |
| Sweden | 17.0 | 17.6 | 65.6 | 62.6 | 17.4 | 19.8 |
| United Kingdom | 17.8 | 17.8 | 66.3 | 64.1 | 15.9 | 18.1 |
| Iceland | 21.3 | 19.7 | 67.1 | 66.2 | 11.6 | 14.0 |
| Liechtenstein | 17.1 | 14.9 | 71.0 | 68.2 | 11.9 | 17.0 |
| Norway | 19.4 | 17.8 | 66.0 | 65.5 | 14.6 | 16.6 |
| Switzerland (¹) | 15.8 | 14.9 | 68.1 | 67.1 | 16.2 | 18.1 |
| Montenegro | 20.1 | 18.2 | 67.0 | 67.4 | 12.9 | 14.4 |
| The former Yugoslav Republic of Macedonia (²) | 18.9 | 16.6 | 69.8 | 70.2 | 11.2 | 13.3 |
| Albania | 24.9 | 18.2 | 66.3 | 68.7 | 8.8 | 13.1 |
| Serbia (¹) | 15.6 | 14.4 | 67.2 | 66.3 | 17.2 | 19.4 |
| Turkey | 26.6 | 23.7 | 66.6 | 68.0 | 6.8 | 8.3 |

(¹) Break in time series in various years between 2007 and 2017
(²) The population of unknown age is redistributed for calculating the age structure.
*Source:* Eurostat (online data code: demo_pjanind)

eurostat

*Source:* Eurostat, 2017

Because the situation around the word is worrying, all the countries started to evaluate this growth of older people and elaborate strategies to increase the participation of older people in the labor market by creating a tool called Active Ageing Index (AAI) and also to increase the percentage of GDP per capita. Hence the United Nations Economic Commission for Europe (UNECE, 2017) and the European Centre for Social Welfare Policy and Research have worked on the design and production of the methodology of AAI. To obtain a quantitative overall index for active ageing Zaidi et al. (2013) used a set of 22 indicators and four domains (the 1st domain: Employment, the 2nd domain: Participation in Society, the 3rd domain: Independent, Healthy and Secure living, and the 4th domain: Capacity and enabling environment for active ageing). The AAI toolset contains the global AAI index, the AAI index by gender and total, and also the AAI index by each domain.

Active ageing is definitely a phenomenon which influences GDP per capita evolution. Thus, the productivity of workers according to the age structure of the population is related to the levels of economic development.

The novelty of our study which is completing the literature in this field consists of testing and validating econometric models for GDP per capita using panel data, followed by analyzing the effects of active ageing on GDP per capita which is a relevant indicator of active aging.

In order to answer the following research question: What are the effects of active ageing on GDP per capita? we present the results from our econometric testing of GDP per capita in 2006-2016 period for EU-20 countries which includes indicators from three domains of active ageing. Since life expectancy, self-reported unmet needs for dental examination, at least upper secondary educational attainment, participation rate in education and training, healthy life years, life expectancy, and at risk of poverty rate weren't statistically significant, they were dropped from our data analysis.

The empirical results of the study suggest that the employment rate of older workers for men and total, material deprivation rate for men, and relative median income ratio are statistically significant (prob <0.05) and "closely connected" with the GDP per capita.

The structure of this papers is as follows: Section 1 contains an overview of active ageing, in Section 2 is presented the literature review, Section 3 is offering an overview on the data and methodology used, Section 4 presents the results we obtained and the last but not the least section includes our conclusions and suggestions.

## 2. LITERATURE REVIEW

Due to active ageing phenomenon's complexity there are numerous studies in the literature that aim to provide an overview and an evaluation of this concept.
Using a methodological approach based on Data Envelopment Analysis (DEA) Carla, A., F., Amado, José, M., S., São Jos, & Sérgio, P., Santos (2016) have proposed an alternative methodology to assess the relative performance of European countries in terms of active ageing, covering several AAI limitations. Also, they have identified the strength and weakness of each country in terms of active aging. They have concluded that seven countries are able to reach the maximum score. In the paper titled: "Active Ageing: An Empirical Approach to the WHO Model" the authors (Constanca et al., 2012) validated the construct of active ageing and test empirically the World Health Organisation (WHO) model of Active Ageing. The entire six factors model for the 22 variables was analyzed using six groups of elements derived from the exploration of factor analysis.
The numerical exercise of applying the AAI methodology in the Russian data presented by Varlamova, M., Ermolina, A., & Sinyavskaya, O., (2017) shows that, in the European context, the overall situation with active ageing in Russia is not the most serious. It occupies the 18th place in the ranking of the 28 AAI countries (2012). However, this means 30% of the unused potential for active ageing of the elderly compared to European best practices. The gender gap is even lower than in the EU on average. The results indicate that the capacity and environment favorable to active ageing provide the main contribution (more than 1/3) to the overall level of AAI. Gender differences are the most obvious in the 1: 31.1 and 21.3 points range for men and women appropriately. Russia has the worst results in the third field, where it is on the 26th place in the country's ranking.
Considering three determinant indicators for an active status on the labour market (the level of education, health conditions and societal awareness) Anghel I. & Vasile V (2016) applied multiple regression models on panel data insured by Eurostat for EU28 countries and the 2001-2014 period in order to test the key factors mentioned on the elderly people to keep working even after the retirement age. Life-long learning programs, incentives to upgrading the education level along the adult life and opportunities for the older people looking for a change in professional life represent same methods that have already demonstrated they may be efficient in leading countries all over the world. Apart from the differences in the degree of use of the potential of older men and women, there may also be differences between different social groups. The assumption is that the more privileged groups in terms of education or income levels, for example, have higher AAIs. These potential group differences in AAI results have investigated in "Criteria-specific analysis of the Active Ageing Index (AAI) at national level in Germany" in 2017. Thus, the main purpose of the study in question is to collect data and calculate AAI for different population groups for different time periods (2008, 2010, 2012 and 2014) in Germany and to analyze them in relation to the national context. Marsillas et al. (2017) worked to develop a new measurement tool based on an active ageing model focused on an individual level, built using two broad categories of variables: procedural and state variables that group together the most important dimensions found in scientific literature. Secondly, they explored the relationship between active ageing and life satisfaction and finally, they analyze the potential prediction role of coping strategies related to active ageing.
Utilizing the statistical Composite I-distance Indicator (CIDI) method, Djurovic, I., Jeremic, V., Bulajic, M. & Dobrota, M., (2017) proposed a new methodology for the construction of AAI. Among the benefits of using it, this method determines which input indicators are the most important placing them in order. Also, it identifies the indicators as well as the areas that contribute the most to the rank of the country. The results obtained by the authors represent a solid basis for decision-making and the implementation of the best policies.
The AAI for Spain is calculated by Rodriquez et al. (2017) based on Spanish data resources. Spain ranks 17th in terms of the active aging index in the 28EU. The results obtained by the authors provided an index (27.9) with an absolute value lower than that calculated one for Spain AAI-EU (32.8) due to changes in the sources measuring the independent indicators.

Gomez and Hernandez de Cos (2008) described the empirical results and showed the impact of demographic maturity on GDP per capita evolution in 1960-2000 period. They found that the countries which are defined being mature from a demographic point of view are significantly better in terms of GDP per capita than the non-mature ones.

To be able to anticipate some policies that can help to increase GDP per capita, we analyze the factors that influence the GDP per capita.

## 3. DATA AND METHODOLOGY

Due to the fact that the life expectancy, self-reported unmet needs for dental examination, at least upper secondary educational attainment, participation rate in education and training, healthy life years and life expectancy, and at risk of poverty rate indicators were found not being statistically significant (prob>0.1) they were dropped in from the data analysis.

Our research includes 3 panel data analyzes where 4 indicators were used: employment rate of older workers (ERA_T), relative median income ratio (RMI_T), employment rate of older workers men at 60-64 age (ERA_M1), material deprivation rate men (MDEP_M) ) that influence the GDP per capita (the independent variable) in 2006-2016 period in EU-20 countries: Belgium, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Netherlands, Austria, Poland, Portugal, Slovenia, Finland, Sweden, United Kingdom (see Table 2).

**Table 2: Summary of the Econometric models and Results**

| Econometric model | Results |
|---|---|
| 1. $D(GDP) = \alpha + \beta_1 D(ERA\_T) + \varepsilon$<br>EU-20 countries : Belgium, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Netherlands, Austria, Poland, Portugal, Slovenia, inland, Sweden, United Kingdom<br>2006-2016 period (11 years) | **Fixed model results:**<br>- Variables that are significant at 0.05 level: D(ERA_T)<br>**Random model results:**<br>- Variables that are significant at 0.05 level: D(ERA_T)<br>**Hausman test:**<br>Ho:Fixed Model<br>H1:Random Model<br>**Prob > 0.05 (=0.9443) => we accept H1 Fixed Model**<br>**Heterostedasticity test:**<br>*R-squered <0.05 =>heteroskedasticity<br>**Correction for heteroskedasticity:**<br>Fixed Effect Model with white cross-section |
| 2. $D(GDP) = \alpha + \beta_1 D(ERA\_T) + \beta_1 RMI\_T + \varepsilon$<br>EU-20 countries : Belgium, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Netherlands, Austria, Poland, Portugal, Slovenia, Finland, Sweden, United Kingdom<br>2006-2016 period (11 years) | **Fixed model results:**<br>- Variables that are significant at 0.05 level: D(ERA_T and RMI_T<br>**Random model results:**<br>- Variables that are significant at 0.05 level: : D(ERA_T and RMI_T<br>**Hausman test:**<br>Ho:Fixed Model<br>H1:Random Model<br>**Prob < 0.05 (=0.093)=> we accept H1 Random Model**<br>**Heterostedasticity test:**<br>*R-squered <0.05 =>heteroskedasticity<br>**Correction for heteroskedasticity:**<br>Fixed Effect Model with white cross-section |
| 3. $D(GDP)= \alpha + \beta_1 D(ERA\_M1) + \beta_1 D(MDEP\_M) + \varepsilon$<br>EU-20 countries : Belgium, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, Netherlands, Austria, Poland, Portugal, Slovenia, Finland, Sweden, United Kingdom<br>2006-2016 period (11 years) | **Fixed model results:**<br>- Variables that are significant at 0.05 level: D(ERA_M1) and D(MDEP_M)<br>**Random model results:**<br>- Variables that are significant at 0.05 level: D(ERA_M1) and D(MDEP_M)<br>**Hausman test:**<br>Ho:Fixed Model<br>H1:Random Model<br>**Prob > 0.05 (=0.5658)=>we accept H0 Fixed Model**<br>**Heterostedasticity test:**<br>*R-squered> 0.05 is not hetero |

*Source:* Authors' calculations based on the data provided by Eurostat

The methodology used in is a basic one with classic statistical analysis and econometric modelling on panel data. The data was gathered from Eurostat database and software used to process tha data was E-Views 10.0 Student Version Lite.

The dependent variables used in our analysis are:

- MDEP_M- Material Deprivation rate for men provided by Eurostat;

- RMI_T- Relative median income ratio provided by Eurostat;
- ERA_T - Employment rate for older workers - is calculated by dividing the number of employed persons and persons aged 55 to 59 by the total population of the same age group provided by Eurostat;
- ERA_M1 - Employment rate for older workers - is calculated by dividing the number of employed persons and persons aged 60 to 64 men by the total population of the same age group provided by Eurostat.

According to Evans (1996) the correlation between variables was studied (see Table 3). We found the correlation between ERA_T and GBP being weak (coefficient 0.345129 < 0.39) and the positive sign of t-statistic (5.429380 >2) means that there is a positive significant association and a significant relationship (prob=0.000 <0.05). The correlation between RMI_T and GBP is very weak (-0.013675 is <0.19), the negative sign of t-statistic (-0.201921 < 2) means there is a negative significant association and a non-significant relationship (prob is 0.8402 >0.05). The correlation between ERA_M1 and GBP is weak (0.267219 is <0.39), the positive sign of t-statistic (4.094333 >2) means there is an positive significant association and an significant relationship (prob is 0.0001 <0.05). The correlation between MDEP_M and GBP is very weak(-0.709712 is <0.39), the negative sign of t-statistic ( -14.87424 <2) means there is an negative significant association and an significant relationship (prob is 0.000<0.05).

**Table 3: Correlation matrix for Model 1, Model 2 and Model 3**

**Model 1:**

Covariance Analysis: Ordinary
Date: 06/23/18 Time: 10:15
Sample: 2006 2016
Included observations: 220

| Correlation<br>t-Statistic<br>Probability | GDP | ERA_T |
|---|---|---|
| GDP | 1.000000<br>-----<br>----- | |
| ERA_T | 0.345129<br>5.429380<br>0.0000 | 1.000000<br>-----<br>----- |

**Model 2:**

Covariance Analysis: Ordinary
Date: 06/23/18 Time: 08:53
Sample: 2006 2016
Included observations: 220

| Correlation<br>t-Statistic<br>Probability | GDP | RMI_T | ERA_T |
|---|---|---|---|
| GDP | 1.000000<br>-----<br>----- | | |
| RMI_T | -0.013675<br>-0.201921<br>0.8402 | 1.000000<br>-----<br>----- | |
| ERA_T | 0.345129<br>5.429380<br>0.0000 | -0.431784<br>-7.068042<br>0.0000 | 1.000000<br>-----<br>----- |

**Model 3**

Covariance Analysis: Ordinary
Date: 06/23/18 Time: 08:44
Sample: 2006 2016
Included observations: 220

| Correlation<br>t-Statistic<br>Probability | GDP | ERA_M1 | MDEP_M |
|---|---|---|---|
| GDP | 1.000000<br>-----<br>----- | | |
| ERA_M1 | 0.267219<br>4.094333<br>0.0001 | 1.000000<br>-----<br>----- | |
| MDEP_M | -0.709712<br>-14.87424<br>0.0000 | -0.161821<br>-2.421173<br>0.0163 | 1.000000<br>-----<br>----- |

*Source:* Authors' calculations based on the data provided by Eurostat

Moving forward, we have tested stationarity for our series. Based on Levin, Lin & Chu (2002) method, Im, Pesaran and Shin W-stat method, ADF-Fisher method and PP-Fisher method, the results indicating a prob>0.05. In the same time, Haidri Method gave prob<0.05. As more than 2 tests are pointing a probability higher than 0.05, we tested Unit Root in first difference series for all variables, except relative median income ratio. The results suggest that all series became stationary after unit root test with first difference.

We performed heteroskedasticity test for all the variables. Probability p (obs*r-square) < 0.05 indicates the presence of heteroskedasticity in all our models, except Model 3 where p (obs*r-square) > 0.05 indicates the presence of homoskedasticity. To correct heteroskedasticity we estimated both Random and Fixed Effect Models with White cross-section starting from the following equation:

$$D(GDP) = \alpha + \beta_1 D(ERA\_T) + \varepsilon \quad (1)$$

where α is the intercept of the model, $\beta_1$ is the coefficient of the variable that show the change of GDP per capita due to the variation of the unit of the independent variables and ε is the model error term.
We continue our analysis by introducing another indicator. Thus, the model takes the following mathematical form:

$$D(GDP) = \alpha + \beta_1 D(ERA\_T) + \beta_2 RMI\_T + \varepsilon \quad (2)$$

Our study continues with another model of GDP per capita by gender (men). The mathematical form of this model is:

$$D(GDP) = \alpha + \beta_1 D(ERA\_M1) + \beta_2 D(MDEP\_M) + \varepsilon \quad (3)$$

## 4. RESULTS

In the Table 4, a detailed output of the Fixed Effects Model with variables in levels is presented. The variable represented in the estimation of equation (1) model are statistically significant at 5% level. The ERA_T has an impact on GDP per capita (p-value=0.0015). The model has reported a coefficient that equals to 0.611. The positive sign supports the claim that an increase 1% in this ratio contribute to an increasing of GDP per capita with 0.611%.

**Table 4. Fixed Effect Model with white cross-section correction for heteroskedasticity for 2007-2016 period**

Dependent Variable: D(GDP)
Method: Panel Least Squares
Date: 06/17/18 Time: 11:40
Sample (adjusted): 2007 2016
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200
White cross-section standard errors & covariance (d.f. corrected)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.652197 | 0.181466 | -3.594051 | 0.0004 |
| D(ERA_T) | 0.611438 | 0.189907 | 3.219661 | 0.0015 |

Effects Specification

Cross-section fixed (dummy variables)

| | | | |
|---|---|---|---|
| R-squared | 0.170138 | Mean dependent var | -0.075000 |
| Adjusted R-squared | 0.077415 | S.D. dependent var | 4.064724 |
| S.E. of regression | 3.904219 | Akaike info criterion | 5.661061 |
| Sum squared resid | 2728.484 | Schwarz criterion | 6.007384 |
| Log likelihood | -545.1061 | Hannan-Quinn criter. | 5.801213 |
| F-statistic | 1.834920 | Durbin-Watson stat | 2.002359 |
| Prob(F-statistic) | 0.020005 | | |

*Source:* Authors' calculations based on the data provided by Eurostat

In Table 5, we represented an econometric model including factors that are influencing GDP per capita. The Random Model with white cross section suggests only the ERA_T is statistically significant with probability p=0.0001. The results obtained are similar with the precedent analysis, the only differences are the percentages. Hence, when the ERA_T rises with 1%, the GDP per capita increase with 0.613%.

**Table 5. Random Effect Model with white cross-section correction for heteroskedasticity for 2007-2016 period**

Dependent Variable: D(GDP)
Method: Panel EGLS (Cross-section random effects)
Date: 06/17/18 Time: 12:58
Sample (adjusted): 2007 2016
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200
Swamy and Arora estimator of component variances
White cross-section standard errors & covariance (d.f. corrected)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.094955 | 0.825112 | -0.115081 | 0.9085 |
| D(ERA_T) | 0.613766 | 0.158483 | 3.872753 | 0.0001 |
| RMI_T | -0.667232 | 0.879464 | -0.758680 | 0.4490 |
| Effects Specification | | | | |
| | | | S.D. | Rho |
| Cross-section random | | | 0.088750 | 0.0005 |
| Idiosyncratic random | | | 3.850745 | 0.9995 |
| Weighted Statistics | | | | |
| R-squared | 0.077803 | Mean dependent var | | -0.074802 |
| Adjusted R-squared | 0.068440 | S.D. dependent var | | 4.063590 |
| S.E. of regression | 3.922069 | Sum squared resid | | 3030.377 |
| F-statistic | 8.310107 | Durbin-Watson stat | | 1.804721 |
| Prob(F-statistic) | 0.000343 | | | |
| Unweighted Statistics | | | | |
| R-squared | 0.077845 | Mean dependent var | | -0.075000 |
| Sum squared resid | 3031.929 | Durbin-Watson stat | | 1.803797 |

*Source:* Authors' calculations based on the data provided by Eurostat

Another econometric model by gender caring the factors that had a significant impact on GDP per capita during the 2006-2016 period is presented in Table 6. Both the variables considered are statistically significant with a probability p=0.0276. respective p=0.0061 at 5% level. The results show that an increase with 1% in the ERA_M1, lead to an increase of GDP per capita with 0.24%. The MDEP_M is significant with a coefficient equal to 0.38 (p-value=0.0061). The negative sign implies that, whenever this rate decreases by 1%, the GDP per capita increase by 0.38. We can conclude that the ERA_T and ERA_M1 and MDEP_M have a significant impact in the present analyzed periods.

**Table 6. Fixed Effect Model for 2006-2016 period**

Dependent Variable: D(GDP)
Method: Panel Least Squares
Date: 06/23/18 Time: 08:27
Sample (adjusted): 2007 2016
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.359903 | 0.286278 | -1.257182 | 0.2103 |
| D(ERA_M1) | 0.241677 | 0.108838 | 2.220515 | 0.0276 |
| D(MDEP_M) | -0.380822 | 0.137087 | -2.777967 | 0.0061 |
| Effects Specification | | | | |
| Cross-section fixed (dummy variables) | | | | |
| R-squared | 0.189133 | Mean dependent var | | -0.075000 |
| Adjusted R-squared | 0.093469 | S.D. dependent var | | 4.064724 |
| S.E. of regression | 3.870102 | Akaike info criterion | | 5.647905 |
| Sum squared resid | 2666.029 | Schwarz criterion | | 6.010720 |
| Log likelihood | -542.7905 | Hannan-Quinn criter. | | 5.794731 |
| F-statistic | 1.977056 | Durbin-Watson stat | | 2.026836 |
| Prob(F-statistic) | 0.009150 | | | |

*Source:* Authors' calculations based on the data provided by Eurostat

## 5. CONCLUSIONS

In this paper, we examined the effect of a set of explanatory economic variables used in the literature for analyzing the factors GDP per capita. The findings provided an evidence on 20 EU countries, pointing that ERA_T, ERA_M1 and MDEP_M are the key factors having impact on pension spending. Thus, ERA_T and ERA_M1 lead to an increase in GDP per capita, while MDEP_M is contributing to a reduction of GDP per capita. Based on the results obtained GDP per capita is highly influenced by economic factors. As was shown in this paper the ERA_T and ERA_M1 are the economic factors that influences the increase in GDP per capita.

The elderly population has a key role in the process of economic development and implicitly in the growth of GDP per capita. Thus, the older people have experience on the labor market, earning higher wages than young people. A country that has more elderly workers will differ from a country that has more young workers.

One way to contributing to an increasing of GDP per capita may be the increasing the standard age of retirement or increasing the level of social contributions of the employees and of the employers.

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