Determinants of ageing in Romania. Evidence from regional-level panel analysis

Dănuț-Vasile JEMNA[*], Mihaela DAVID[**]

Abstract

At different stages, all countries of the world are going through the demographic ageing process, with the most diverse economic and social implications. Romania has entered this process since the communist period, as a result of both the demographic transition and the transformations imposed by the demographic and economic policies implemented by the state. After 1990, the transition period has accelerated the increasing pace of this phenomenon, especially through increased migration, declining fertility and changes in the labour market. The regional economic, social and demographic gaps inherited from the past were accentuated after the fall of the totalitarian regime, so that the population ageing has intensified and it is experienced differently at the territorial level. This study aims at identifying the determinants of the increase in population ageing, along with the decrease in the share of young population, across the eight development regions of Romania, during the 1995-2018 period.

Keywords: demographic transition, demographic ageing, Romania, regional level, heterogeneous panel data

Introduction

Population ageing is a global phenomenon and affects, to a greater or lesser extent, all countries in the world, raising a series of fundamental questions regarding the future evolution of human society. Within the context of increasing life expectancy and the tendency to prolong the active life of people aged 65 or older, governments and national and international organizations are involved in the development of strategies and policies on the elderly population. According to the UN, the level of global ageing population will increase significantly in the coming decades, from 6% in 1990 to 16% in 2050 (UN, 2019). The main challenges raised by the continuously growing share of older persons in the total population, along with the decrease in the share of young people, are related to ensure healthy lives and to promote well-being for people aged 65 or older, especially by means of the national health and social security system.

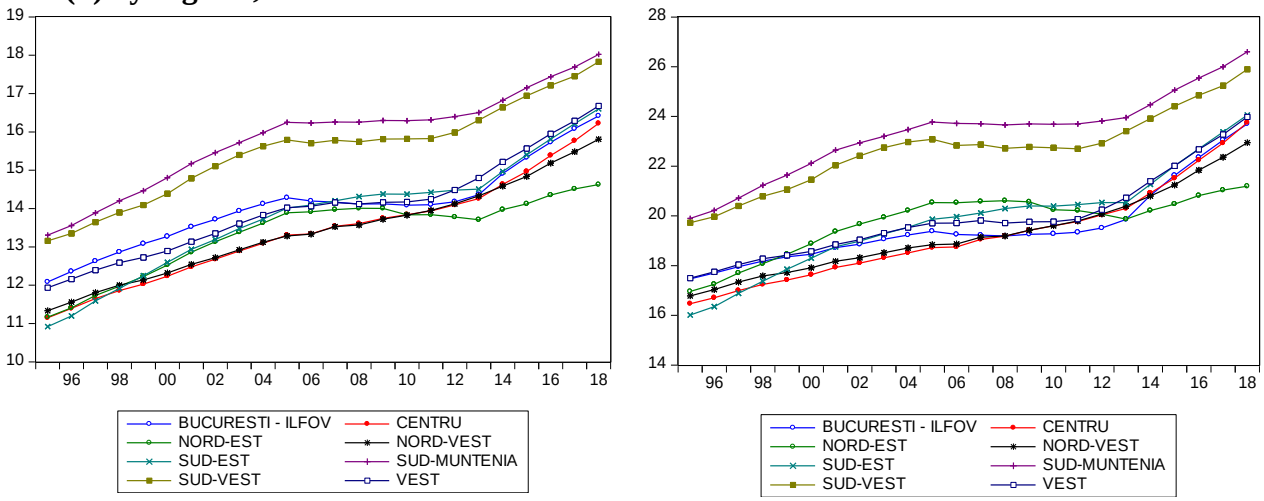
[*] Dănuț-Vasile JEMNA is professor at Faculty of Economics and Business Administration, "Alexandru Ioan Cuza" University of Iasi, Romania, e-mail: danut.jemna@uaic.ro.
[**] Mihaela DAVID is postdoctoral researcher at Doctoral School of Economics and Business Administration, "Alexandru Ioan Cuza" University of Iasi, Romania, e-mail: mihaela_david88@yahoo.com.

Empirical studies have shown that the main factors responsible for population ageing are declining fertility, rise of life expectancy and emigration (Hoff, 2011; Bloom and Luca, 2016; Murphy, 2017; Yang *et al.*, 2019; Nagarajan *et al.*, 2020). Demographic ageing refers to the simultaneous phenomenon of increasing the share of elderly population and the one decreasing the share of young people at the level of a country or region. At the same time, the increase in life expectancy leads to an increase in the median age and the share of total elderly population. In turn, migration brings important changes in the age structure of the population. Basically, where net migration is negative, the population will have an aging trend, as young people are more exposed to migration, especially on the ground of continuing their studies and finding work.

In 2019, 20.3% of the EU population was aged 65 and over, and by 2050, older persons are expected to account for 28.5 % of the total population. In comparison, the share of older Romanians was lower in 2019 (18.5%). However, the prospects on the evolution of population ageing in Romania are not more encouraging. According to the UN estimates, by 2050, the share of people aged 65 and older in the population will exceed 30%. In Romania, the ageing process of population begun in the communist period, especially after 1980. The share of elderly in the population exceeds that of young people starting with 2009, namely 16% compared to 15%. The phenomenon is becoming more and more alarming especially in rural areas, because this area is the most affected by migration and lower socio-economic conditions. Besides the differences between urban and rural areas, the level of ageing admits important disparities at the level of Romanian counties and regions. The most affected are the counties in the southern Romania, areas with a low degree of urbanization and a low level of economic development (Jemna, 2017, pp. 190-192). This reality will put a lot of pressure on the public pension and health insurance system, on the need to respond to specific problems for this category of population.

For the period 1992-2019, the data provided by the Eurostat show an increase in the share of elderly for all regions (Figure 1a), and the demographic ageing index displays not only an intensification of the phenomenon, but also an increase in regional differences (Figure 1b). In this respect, the southern regions of the country (South-West Oltenia and South-Muntenia) stand out with the highest levels of population ageing. The Bucharest-Ilfov region has a growing trend until 2005, followed by a period of stagnation, with slight variations of the old-age dependency ratio, but below the national average for the entire period. It is also interesting to note the evolution of the North-East region, which has a significant increase in ageing index between 1999 and 2008, 16.9% and 20.6% respectively. However, the following period is highlighted by a decline in population ageing, which places it in the most advantageous position over the other regions.

Figure 1. The evolution of the share of elderly population (a) and of the old-age dependency ratio (b) by regions, 1992-2019



a *b*

Source: Own representations using Eurostat data

Empirical studies on the ageing population in Romania, both qualitative (Crăciun, 2011) and quantitative (Gîrleanu-Şoitu, 2004; Precupetu *et al.*, 2019), are relatively few, and those in regional profile are missing. The importance of studies on this topic is underlined by the pace with which the phenomenon develops and, especially, by its implications on society as a whole. Within the context of the analyses and plans developed at the EU level, Romania has adopted a series of strategies on the elderly population, such as The National Strategy on Active Ageing Promotion and Protection of Elderly and the Strategic Plan of Actions 2015-2020. This strategy took into consideration a series of measures and actions regarding three directions: adequate financing of the healthcare system for elderlies; prolonging the active life and participation in the labour market; involving people of this age category in various social activities (Romanian Government, 2015).

The implementation of such policies requires specialized studies evaluating the main determinants of the demographic ageing at national level and, especially, indicating the existing inequalities at regional level. Besides, to the best of our knowledge, there were no studies carried out to identify the determinants of population ageing at regional level in Romania. Therefore, the present study addresses this need and covers a gap in the related literature by using different estimation techniques for panel data models encompassing the eight development regions of Romania for the period 1995-2018.

The paper is organized as follows. In Section 1, an analysis of the literature is performed to evaluate the results obtained for various countries and socio-economic contexts. Section 2 presents the data used and the methodological strategy. Section 3 presents and discusses the results obtained at regional level. The paper ends with a set of conclusions and references.

1. Literature review

Demographic ageing refers to the simultaneous phenomenon of increasing the share of the elderly population and decreasing the share of young people in a country or region. The topic is of great interest and raises a series of fundamental questions regarding the evolution of human society in the future. Population ageing is the 21st century's dominant demographic phenomenon and affects, to a greater or lesser extent, all the countries in the world (UN, 2019).

Due to the complexity of the phenomenon, not only demographers, but also economists, sociologists, psychologists, doctors, biologists, etc. put a lot of effort in understating the process of population ageing. Demographers are interested in explaining the change in population structure using theories related to the nature of the evolution of demographic phenomena, while specialists in other fields aim to assess this phenomenon in relation to population health, insurance and social assistance systems, income, labour market, globalization, etc. Interdisciplinary studies focus on identifying both the determinants of population ageing process and its effects on economic and social life. According to the aim of this research, the discussion on related literature is limited to the impact of demographic, economic and social factors on ageing.

1.1. Ageing and demographic factors

From a demographic perspective, research on population ageing highlights that demographic transition has inevitably led to a change in population structure by age groups (Robine and Michel, 2004; UN, 2019; Garcia *et al.*, 2019; Harper, 2019). The decrease in fertility and mortality rates, as basic phenomena of the demographic transition, led to the decrease in the share of young people along with an increase in the share of the elderly (Notestein, 1954). Mainly, the decrease in fertility has led to an increase in the median age of the population, as well as to a decrease in the share of the young population, while the population over 65 has also increased (Murphy, 2017; Harper, 2019; Garcia *et al.*, 2019). Moreover, the decline in mortality has had an impact on increasing the degree of ageing (Murphy, 2017), but differentiated from one country to another and from one age group to another. The impact of mortality is more important in the final phase of the transition process, when low mortality rates increase the share of the elderly. Particularly in the developed countries, where even if the fertility level will not change significantly, the decrease in mortality will lead to an increase in the share of elderly population (Casseli and Vallin, 1990).

Along with declining fertility and mortality, life expectancy is also a strong factor correlated with demographic ageing. Increasing life expectancy is a common phenomenon in all countries and depends on the progress in health and living standards. This evolution has an important contribution to increasing the share of the elderly population (Harper, 2019). Consequently, this led to a special interest in studies analysing the life expectancy of the elderly in relation to the quality of their life. According to the estimates performed by the UN, a 65-year-old person is currently hoping to live at least 17 years (UN, 2019). Regarding the quality of this period of life, an indicator called healthy life expectancy was developed, which measures the average number of years that a person lives in healthy conditions (Sullivan, 1971; WHO, 2016). For the elderly people, the lack of morbidities and disabilities is especially taken into account. It should also be noted that life expectancy is higher in women by almost 5 years, making the female population older than the male one (UN, 2019).

Existing research also shows that migration has an important influence on the degree of demographic ageing (Findlay and Wahba, 2013; Neumann, 2013; Garcia *et al.*, 2019; Nagarajan *et al.*, 2020). Emigration tends to aggravate the phenomenon, because young people are the most willing to emigrate, which also affects fertility levels. At country level, ageing can also be explained by the immigration of elderly people who are looking for a quality living environment (Garcia *et al.*, 2019). In return, internal migration can contribute to increasing disparities in the population structure by groups. More developed and urbanized areas are more attracting for young people, while the elderly are less mobile and are more connected to the places where they have already lived their lives (Garcia *et al.*, 2019).

Last but not least, besides geographical and sex differences, the ageing process also displays differences in terms of urbanization, which is also an important determinant of demographic transition. Whilst the development of cities attracts young people, the rural area is ageing at a fairly high rate. This is not only due to the attraction of young people, but also because of the immigration of adults who are looking for quieter and safer areas. The rural space is also exposed to continuous transformation and is very heterogeneous, both from a demographic and socio-economic perspective. In the former communist countries, including Romania, the rural-urban imbalances in the population structure are also caused by internal migration as a result of the state's policies of industrialization and forced urbanization during the 1960-1980 period (Neményi, 2011).

1.2. The impact of economic factors on ageing

Another special focus is put on studies that take into account the relationship between changing population structure and economic activity. Ageing is usually considered to have an important impact on economic development, but there are also studies that take into account the reverse causality (Alders and Broer, 2004; Nagarajan *et al.*, 2020). The UN reports on the ageing phenomenon show disparities in regional economic development. Thus, trends indicate that the most demographically aged areas are represented by the developed countries in Asia, the USA, Europe, Australia and New Zealand (UN, 2019), while developing countries have entered in an accelerated ageing process. Moreover, quantitative and qualitative empirical studies have shown that the level of income, the degree of development of a region, the level of activity of the elderly population, the employment rate of female population, or the unemployment have a significant impact on the ageing population (Bagheri-Nesami and Shorofi, 2014; Hsu *et al.*, 2019; Nagarajan *et al.*, 2020). Therefore, the impact of economic factors differs from one country to another and from one development region to another.

1.3. Social determinants of population ageing

Other studies analyse the relationship between demographic ageing, level of education and public policies in healthcare system. Education is considered one of the most important determinants of demographic transition and, implicitly, of changing the age structure of the population (Canning, 2011; Murtin, 2013). Increasing the level of education in a country has an impact not only on the labor market, fertility and family decisions, but also on mental health and an increased healthy life expectancy for the elderly population (Schneeweis *et al.*, 2014). Demographic changes during the transition period have been accompanied by a development of medical technology and a permanent increase in healthcare and access to health services. All of this has contributed to increasing lifespan, lowering mortality and increasing population ageing. For developing countries, there is a positive impact of policies that have improved the healthcare system on ageing population (Nagarajan *et al.*, 2020). In addition to the improvements in health services, the increase in the share of elderly is also determined by lifestyle changes, especially those related to diet and reducing health risk factors such as tobacco and alcohol consumption (WHO, 2016; UN, 2019).

For Romania, the ageing process of population is inevitable, as in all countries in the region. The phenomenon has a series of specificities related to the history of the last 80 years, but also to the existing differences at regional level. The analysis of the factors that contribute to the increase in

population ageing and of the existing disparities among regions represent an important basis for designing public policies in an era of demographic ageing which recalls for concrete actions to face its implications at the level of the entire society. In this study, based on the existing literature, we assess the extent to which a number of demographic, economic and social factors have an impact on population ageing across the eight development regions of Romania. The phenomenon should not be seen as a burden or a negative aspect of the evolution of society, but it is imperative that policy makers be prepared to face the demographic changes that are taking place and to ensure a long and healthy life for the elderly.

2. Data and methodology

2.1. Data used

In order to identify the main determinants of demographic ageing at the level of the eight development regions of Romania, during the 1995-2018 period, we rely on data provided by Eurostat. For the analysis of the ageing trends we resorted to old-age dependency ratio, which is defined as the number of persons aged 65 and over per 100 persons of working age (15-64). In line with the literature on the determinants of population ageing, we consider the following explanatory variables: real GDP per capita expressed in current prices, lei (used to measure the regions' economic performance); number of tertiary education graduates per 1,000 inhabitants (as a proxy for the human capital variable); female employment rate (defined as the percentage of females aged 15 and above who are active in the labour force); unemployment rate (defined as the number of unemployed persons divided by the labour force, where the labour force is the number of unemployed persons plus the number of employed persons); number of doctors per 1,000 inhabitants (as a proxy to measure the improvements in healthcare services); degree of urbanization (defined as the share of people living in urban areas); net migration rate (expressed as average annual net number of migrants per 1,000 population).

Most empirical studies from literature use the data transformed by logarithm to homogenize the data series. Thus, in the econometric modelling step of this study, all variables are used following the transformation with the log operator, with the exception of net migration rate for which negative values are also registered.

2.2. Empirical strategy

The empirical investigation consists of several steps: (1) test for stationarity; (2) test for cointegration; (3) panel data modelling. Stationarity and panel cointegration tests are employed to avoid the "spurious" regression problem. Considering the specificity of our panel data, we explore the time series properties of variables using three types of panel unit root tests. From the first category, we employed a Fisher-type test developed by Choi (Fisher-ADF, 2001) and the test proposed by Im, Pesaran, and Shin (IPS, 2003) because these approaches allow the autoregressive parameter to be specific to each region and also because they do not impose the restriction of a balanced panel. From the second category, we selected the test introduced by Levin, Lin, and Chu (LLC, 2000) for considering the relatively small size of the panel, which is inherent when analysing data at a regional level, over a short period taken as a reference.

Given that variables are integrated of the same order, we test for cointegration, by relying on the cointegration tests developed by Pedroni (2004), Kao (1999), and Maddala and Wu (1999). These tests assume the null hypothesis of no cointegration, against different specifications of the alternative hypothesis of cointegration. The rejection of no cointegration assumption highlights that a long run relationship exists between series.

To assess the long run relationship between population ageing and different determinants, in this paper we build several panel models with different specifications. In this respect, the difference between pooled and heterogeneous panel data is underlined.

Specifically, the pooled time series regression equation is:

$$lnOADR_{it} = \beta_0 + \beta ln X'_{it} + \varepsilon_{it},\ i = \overline{1,n}\ ,\ t = \overline{1,T}, \tag{1}$$

where $lnOADR_{it}$ is the logarithm of old-age dependency ratio, lnX'_{it} is the vector of independent variables expressed in logarithmic form, and ε_{it} is the error term assumed with conditional mean zero and independent of X'_{it}. The β coefficients represent partial elasticities of old-age dependency ratio in relation to each independent variable.

According to Wooldridge (2015), the key feature of panel data that distinguishes them from a pooled cross section is that the same cross-sectional units are followed over a given time period. In other words, the pooled OLS estimation is simply a standard OLS technique run on panel data, which assumes that is no heterogeneity, *i.e.* the specific effects of each cross-sectional unit are completely ignored.

Considering the limitations raised by pooling cross-sectional observations over time and the fact that the panel is heterogeneous (*i.e.* the time dimension is large and the cross-sectional one is small), other estimation techniques are required. Moreover, if the series were shown to be cointegrated, the equation (1) is estimated using full modified ordinary least square (FMOLS), panel dynamic ordinary least square (DOLS) and group-mean full modified ordinary least square (GM-FMOLS) methods. Mark and Sul (2003) develop the panel DOLS estimator as an alternative to the panel FMOLS estimator proposed by Pedroni (1997) and Phillips and Moon (1999). Precisely, the panel DOLS allows heterogeneity over cross sections, includes individual-specific time trends, individual-specific fixed effects and time-specific effects, and adjusts for the potential long-term endogeneity of the regressors. In addition to this alternative, Pedroni (2001) follows a semi-parametric correction to the other forms of the panel FMOLS estimator by allowing the associated serial correlation properties of the error processes to vary across individual units of the panel. Both panel DOLS and GM-FMOLS methods provide consistent and efficient estimation of the cointegrating vector, especially where non-stationarity, endogeneity and serial correlation problems are suspected.

3. Empirical results

To assess the stationarity of variables, Table 1 summarizes the results of the Fisher-ADF, IPS and LLC unit root tests. In order to test for both difference and trend stationarity, both the intercept and the trend are included in the auto-regressive specification of these tests.

Table 1. Panel unit root tests

	Undifferenced			First difference		
Variables	**LLC**	**IPS**	**Fisher-ADF**	**LLC**	**IPS**	**Fisher-ADF**
LOADR	3.6134	5.3268	4.8811	-3.1143 ***	-5.1560 ***	56.3027 ***
LRGDP	-3.5796 ***	-0.0358	12.9501	-4.5041 ***	-2.9860 ***	33.5573 ***
LEDUC	-0.1654	0.3245	9.4292	-3.5862 ***	-3.6104 ***	39.9652 ***
LHEALTH	0.1300	2.2525	5.8467	-7.2845 ***	-6.5558 ***	71.8525 ***
LFEMPLOY	-0.6128	-0.4643	14.1483	-2.6662 ***	-5.7146 ***	62.5904 ***
LUNEMPLOY	0.7905	1.5288	7.7592	-7.5285 ***	-7.9637 ***	88.0428 ***
LURB	0.9845	1.7269	6.2826	-8.2727 ***	-7.7682 ***	85.7570 ***
NMIGR	-0.7024	-1.6086	32.0217	-6.8895 ***	-6.1837 ***	69.3193 ***

Notes: Variables were abbreviated as follows: LOADR - log of old-age dependency ratio; LRGDP - log of real GDP per capita; LEDUC - log of number of graduates per 1000 inhabitants; LHEALTH - log of number of doctors per 1000 inhabitants; LFEMPLOY - log of female employment rate; LUR - log of unemployment rate; LURB - log of urbanization degree; NMIGR - net migration rate. For LLC test, the null hypothesis indicates that there is a common unit root for each panel, while for IPS and Fisher-ADF, the null hypothesis implies that there is an individual unit root for each panel in the series. *** indicates significance at the 1% level; ** indicates significance at the 5% level; * indicates significance at the 10% level.

Source: Own estimations

As illustrated by Table 1, the results from all the tests indicate that the null hypothesis of the presence of a unit root cannot be rejected, *i.e.* all the series under considerations are nonstationary. Nevertheless, as emphasized by low p-values, the variables appear to be stationary in first-difference. Therefore, since all variables are non-stationary and of the same order of integration, it is important to proceed with testing for the presence of cointegration relationships between old-age dependency ratio and its determinants. The results for the panel cointegration tests developed by Kao (1999), Maddala and Wu (1999) and Pedroni (2004) are reported in Table 2.

Table 2. Panel cointegration tests

Cointegration statistics	Values
Pedroni	
Panel ν-Statistic	-1.123
Panel ρ-Statistic	3.398 ***
Panel t-Statistic (non-parametric)	2.203 **
Panel t-Statistic (parametric)	2.224 **
Group ρ-Statistic	4.451 *
Group t-Statistic (non-parametric)	1.787 *
Group t-Statistic (parametric)	2.934 ***
Kao cointegration test	-2.352 ***
Fisher cointegration test for one vector	96.26 ***

Notes: The tests assume the null hypothesis of no cointegration. *** indicates significance at the 1% level; ** indicates significance at the 5% level; * indicates significance at the 10% level
Source: Own estimations

Irrespective of the considered test, the low p-values suggest that there is a cointegrating relationship among variables. Therefore, having established that the variables are structurally related, the long-run equation is estimated using the FMOLS, DOLS and GM-FMOLS estimation techniques for heterogeneous cointegrated panels. Table 3 summarizes the estimation results that are qualitatively similar, with the exception of FMOLS model that fails to explain the influence of female employment rate and unemployment rate on population ageing.

From our empirical findings, several points can be emphasized. For the panel estimation, real GDP per capita has a positive sign and is statistically significant, which implies that those regions with higher real GDP per capita are, on average, regions with a higher ageing population. This relationship is explained by the fact that real GDP per capita contributes positively, on the one hand, to a rise in life expectancy, due to an improvement in living standards, and on the other hand, to a drop in fertility rates, due to the increase in opportunity cost of time devoted to childcare. The increase of old-age dependency ratio is also associated with the increase in the number of doctors per 1000 inhabitants, which leads further to a higher level of life expectancy (Nagarajan *et al.*, 2020).

Table 3. Panel regression estimates of the old-age dependency ratio, 1992-2018

Variables	FMOLS Model (1)	DOLS Model (2)	GM-FMOLS Model (3)
LRGDP	0.0672 ***	0.0397 ***	0.0372 ***
	(0.0123)	(0.0117)	(0.0064)
LEDUC	0.0746 *	0.0326 **	0.0325 ***
	(0.0403)	(0.0128)	(0.0066)
LHEALTH	0.2057 ***	0.3258 ***	0.3586 ***
	(0.0567)	(0.0634)	(0.0332)
LFEMPLOY	-0.0272	-0.0730 ***	-0.0963 ***
	(0.0516)	(0.0235)	(0.0302)
LUNEMPLOY	-0.0196	-0.0303 **	-0.0485 ***
	(0.0119)	(0.0121)	(0.0063)
LURB	-0.3640 **	-0.2702 *	-0.2207 ***
	(0.1486)	(0.1440)	(0.0678)
NMIGR	0.0011 ***	0.0088 **	0.0059 ***
	(0.0033)	(0.0041)	(0.0015)
Adjusted R^2	0.8458 ***	0.8713 ***	0.8919 ***
No. of regions	8	8	8
No. of observations	192	192	192

Notes: Variables were abbreviated as follows: LRGDP - log of real GDP per capita; LEDUC - log of number of graduates per 1000 inhabitants; LHEALTH - log of number of doctors per 1000 inhabitants; LFEMPLOY - log of female employment rate; LUR - log of unemployment rate; LURB - log of urbanization degree; NMIGR - net migration rate. FMOLS: pooled FMOLS estimator of Pedroni (1997) and Phillips and Moon (1999); DOLS: pooled DOLS estimator of Mark and Sul (2003); GM-FMOLS: group-mean panel FMOLS estimator of Pedroni (2000). All regressions include fixed effects. Given the limited number of time-series observations, the DOLS regression was estimated with only one lead and one lag. Standard errors in brackets. *** indicates significance at the 1% level; ** indicates significance at the 5% level; * indicates significance at the 10% level.
Source: Own estimations

In the case of human capital, the panel data estimations show that the number of graduates per 1,000 inhabitants has a positive contribution to the old-age dependency ratio. Our findings are in compliance with the ones obtained by Schneeweis *et al.* (2014), which indicate that education attainment has not only an indirect negative effect on fertility, since it directly influences marriage and female employment, but also a positive impact on a healthy life expectancy for the elderly population.

In addition to the rise in education, the participation of women in the labour force emerges as negative and significant in terms of population ageing index. Our results are in line with an argument put forward by Jemna and David (2018) that the decline in total fertility rate across Romanian regions is explained by the decline in labour force participation among women, which in the end causes an increase in population ageing. Moreover, the decrease in unemployment rate explains significantly the increase in population ageing at regional level. A high and long-term unemployment level contributes to the postponement of the first and second birth, with obvious direct implications upon fertility decrease (Goldstein *et al.*, 2009; Adsera, 2011), and thus upon population ageing.

In line with several studies on demographic ageing, both internal and external migration is significantly associated with population ageing. On the one hand, the response of old-age dependency ratio to an increase in urbanization is negative and statistically significant. These results echo the study of Garcia *et al.* (2019) and suggest that while young people are interested in more developed and urbanized regions to continue their education and find a job, the older people prefer to migrate to rural areas for living in the peace and quiet of the countryside. In addition to internal migration, our findings show that net migration also exerts a significant influence on old-age dependency ratio. Hence, the specific negative net migration rates register in almost all regions over the analysed period have a lower but significant negative impact on population ageing. Thus, an increase in the number of emigrants that will continue to exceed the number of immigrants, especially in the working-age population, is expected to lower fertility rates and increase the share of the elderly population at regional level.

Conclusions

This paper examines the impact of demographic and socio-economic drivers of population ageing using panel cointegration techniques at regional level in Romania, during the 1995-2018 period. To estimate the relationship between old-age dependency ratio and its determinants, the stationarity properties of the data are first examined by employing individual along with panel unit root tests. Further, the presence of cointegrating relationships is tested using Kao (1999), Maddala and Wu (1999) and Pedroni (2004) panel cointegration tests. Finally, if found cointegrated, the estimation procedure for heterogeneous panels is employed.

The analysis supports the findings of a long-run relationship among population ageing and real GDP per capita, number of doctors per 1,000 inhabitants, number of graduates per 1,000 inhabitants, female employment rate, unemployment rate, urbanization and net migration rate for the panel as a whole. This implies that the variables are bound together by one long-run equilibrium relationship.

Our findings support the view that an increased level of economic development, higher level of education, improved healthcare system, higher number of emigrants, lower female employment rate, a decreased unemployment rate, and lower urbanization explain significantly the increase in population ageing index at regional level.

These empirical results have important implications for the sample of eight Romanian regions. During the last decades, Romania has experienced decreases in fertility along with increases in population ageing, due to improvements in technology, investments in higher education and health

system, and overall improvements in living standards. A major consequence of ageing population is the increase of health cost of the elderly people, which puts further pressure on the pension, health and social assistance systems. Therefore, from a policy point of view, it is imperative to implement reforms in the labour market, pension and health systems in order to respond to the demographic changes in the structure of population. In this respect, a very important step was made through The National Strategy on Active Ageing Promotion and Protection of Elderly and the Plan of Actions 2015-2020, adopted by the Government in order to deal with the most problematic issues for Romania. Within this context, the strategy recommends a range of measures and policies to be developed in order to encourage longer working life and maintain the ability to work, to reduce the risk of poverty and social exclusion among older persons, to ensure lifelong learning, to promote and safeguard the dignity, health and independence in older age, and last, but not least, to maintain and enhance the intergenerational solidarity. Due to the relatively recent stage of implementation of this national plan of actions, it is difficult to make adequate assessments of its impact on the needs of older persons.

However, the report 'Ageing Europe - looking at the lives of older people in the EU', released by Eurostat in October 2019, reveals that the picture of Romania in relation to economic and social situation of elderly persons remains quite the same, *i.e.* the income of older people is low, the health and long term care services are insufficient, the unemployment rate amongst elderly is maintained at high levels, their quality of life is still low, they continue to be considered as assisted persons. Therefore, to ensure and sustain the medium and long term impact of the above mentioned policies, other specific measures should also be taken into account. For instance, the significant influence of net migration exerted on old-age dependency ratio suggests that discouraging emigration, on the one hand, and encouraging immigration, on the other, especially in the working-age population, could be measures that would counteract the ageing population issues. One of the most obvious impact would be on ensuring the public pension system's sustainability. In addition, aiming for a positive net migration rate would lead to an increase in fertility and, eventually, to a decline in population ageing at regional level. In the same time, a special attention should be put not only on the disparities among the Romanian regions, but also to the imbalances within each region - especially in terms of inequalities between rural and urban areas - related to education, health, employment and socio-economic status that affect not only the elderly, but the entire population.

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