DOES THE TYPE OF REGION DETERMINE THE EXTENT OF POPULATION AGING AND THE LEVEL OF WEALTH CREATION?

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Abstract
The development of European regions, which is often specified by gross domestic product per capita, has recently been faced with the increasing challenge of an aging population. Noticeable signs have mainly been observed in small towns and sparsely populated areas.
The aim of this paper is to identify the links between the type of region (predominantly urban, middle urban, and predominantly rural), an aging population and the creation of wealth as an expression of the potential of its development and to verify the hypothesis that predominantly rural regions are characterized by significantly lower wealth generation, but by higher rates of population aging.
The hypothesis has been verified on a sample of European regions at NUTS 3 level, on Eurostat data for 2011, using comparative and classification analyses, and including the application of diagrams.
The obtained result has been used to draw conclusions that are applicable to regional policies, particularly in terms of the need to apply various tools of regional policies within different types of regions.

Keywords
rural urban relationship, aging population, wealth creation, NUTS 3 types, EU regional policy

Introduction
As part of the 2007–2013 programming period the European Union incorporated regional cooperation among the objectives of its cohesion policy, within which transnational and interregional cooperation is supported, including the development of relations between urban and rural regions. While the support for the development of rural areas was transferred, at that time, under the Common Agricultural Policy (Hloušková, 2015).
In pursuing the objectives of EU regional policy one must of course take into account the changing environment and predictions of these changes. Often the EU responds institutionally to these problems, as evidenced by e.g. the establishment of an "expert group on demographic issues" (EC, 2007); there are specific analyses and predictions carried out, stating inter alia that in 2060 Europe will be, in terms of the size of its population, roughly the same, but the population will be much older*:"...the EU will no longer have four people of working age (15–64 years) per one 65+ person, but the ratio will change to only two to one. The largest decline is expected in the period 2015–2035, when the boomers retire. "* (EC, 2008). The whole issue is also widely discussed in society as a whole; this was encouraged by declaring 2012 the "European year of active aging" (EC, 2010).Even national governments are not indifferent to these forecasts; as an example there has been the "2013–2017 National action plan to support positive aging" introduced by the Czech Republic government (MPSV, 2014).
The process of population aging does not affect all regions equally. Economic, social, as well as safety implications can especially be fatal in rural communities. Rural areas compared to urban regions are often characterized by inferior values of different indicators (eg. higher unemployment rates and lower average wage) (Buchta, Štulrajter, 2007). The relations between urban and rural locations are identified as both positive and negative spillover effects in the research conducted by Veneri and Ruiz (2013), which focused on 14 OECD countries

and their small regions. Referring to previous research (Brezza, Dijkstra & Ruiz, 2011; Dijstra and Poelman, 2008; OECD, 2011) they pointed out two facts: i) rural regions often face economic decline and depopulation; this applies especially to rural areas located away from the major population centres; ii) there is a very high variability in the performance of rural regions — some face the aforementioned decline, whereas others show rapid growth, and some of them even outperform urban regions in this regard. Langhamrová and Fiala (2010), among others, point out the economic implications of an aging population by using the example of the Czech Republic, with regard to the amount of the average wage by gender and age, the amount of health care costs, the amount of health insurance and social security deductions as well as the desired pension to net wage ratio with projections to 2060. It is also important to note that the problem of aging is not related only to the European continent, but it is a global issue (Glasgow, Brown, 2012; Davies, 2011). Matter of aging of underdeveloped rural region is often associated with the migration of young people outside the region concerned (Muilu, Rusanen, 2003).

The issue of population aging is closely related to the economic resilience of the regions, as interpreted e.g. by Svoboda and Maštálka (2013), but there are also wider connotations in the context of the understanding of sustainable development. Although some of the conclusions of Ehrlich (1968)do not seem quite correct or seem obsolete nowadays ("Humanity has a clear choice between more people with poorer lifestyles and fewer people with a better quality of life"), as proved by a steady positive progress in the Human Development Index (HDI), presented by the United Nations since 1990 and calculated back to 1980, where between 1980 and 2013 the level of HDI increased in all four assessed groups of countries, although it should be noted that in the 33 years the "Low-Human Development" countries have not reached, by 2013, (with their maximum of 0.540) the minimum of "Very High-Human Development" countries from 1980 (0.583) (Kraftová, 2015). Ehrlich methodology condensed into the sustainability equation (1), which was later modified and expanded in many ways, can be described as timeless.

$$I=PAT, \text{ or } I = P*A*T, \quad (1)$$

where I is the impact on the environment resulting from consumption; P is the population number; A is the consumption per capita (affluence); T is the technology factor.

The first two factors (population and affluence) increase the impact, while the third (technology) decreases it. The view on sustainable development in terms of quantity, i.e. the size of Earth's population, is necessary to supplement with a qualitative view, or with the changing age structure of the population of each region with its economic, social, and security implications. The growth in terms of sustainability cannot be uncontrolled, it must be guided. Even with the purely environmental aspect suppressed it is apparent that there is a clear link between the evolution of the regions’ demographic structure and their performance that in turn affects consumption as well as other components that represent preconditions for a high quality of life. The measures implemented under EU regional policy should also help to create conditions for a multidimensional quality of life.

It appears that regions of different classification or different type often have different characteristics and development. Several typologies have been implemented in order to monitor and review them systematically(OECD, 2010), (MZe ČR, 2007); (Kašparová & Půček, 2009),(Dijkstra & Poelman, 2008).The most relevant typology for the European Union countries is mainly the Eurostat typology (EC, 2011) that represents a modification of the OECD methodology for the purpose of consistent communication and analyses.

Objective, Material and Methods

Considering previous studies in the field of varied development of a range of indicators in rural and urban regions, the aim of this paper is to assess whether the rate of population aging and wealth creation is affected by the type of region, or more precisely, whether a certain type of region is linked with a certain degree of aging and a certain level of wealth creation, or even whether it would be possible to consider the type of region as a relevant indicator of these two aspects.

There are two hypotheses connected with the defined objective:

i) Rural regions are characterized by a lower level of wealth creation when compared with urban regions.

ii) Rural areas are characterized by a higher index of population aging when compared with urban regions.

Hypotheses will be considered confirmed if not more than 20% of the rural NUTS 3 regions of the PR type fall in the <1;306>sequence interval and at the same time not more than 20% of the urban regions NUTS 3 of the PU type fall in the interval <799;1294>.

The basic set of analyzed data consists of data on 1,294 EU regions at NUTS 3. Eurostat data on the age structure of the population in 2011 (Eurostat, 2011) and on the economic level of the regions presented by gross domestic product per capita in 2011 (Eurostat, 2012) have been used. Using the "Urban/rural typology of NUTS 3 regions" (EC, 2011) the total number of regions was divided into 306 (23.6%) of predominantly urban (PU), 492 (38.0%) of intermediate (IN) and 496 (38.4%) of predominantly rural regions.

While the level of wealth creation was evaluated with the aid of the frequently used regional gross domestic product per capita (GDPPC), for the evaluation of the rate of population aging the aging population index (API) was selected, which Matěja (2015) characterizes as the ratio of the number of post-productive and pre-productive age people in the society (2).

$$\text{API} = \frac{\text{No of over 65 residents}}{\text{No of under 15 residents}}, \tag{2}$$

An API value greater than one represents a situation where the post-productive age population outnumbers the pre-productive age population, which means that the society is aging or that an increase in the average age of the population of the region can be realistically expected.

The analysis is divided into three phases: in the first, a comparison of various types of regions is made using basic descriptive statistical characteristics for both evaluated indicators; in the second a correlation between the two indicators is searched for using diagrams; in the third—in order to verify the hypotheses—the ranking of both indicators is performed (downward one for GDPPC, and upward one for API) and the prevalence of each type of region at intervals in groups according to the number of regions found in the interval of PU (sequence of 1–306) , IN (sequence of 307–798) and PR (sequence of 799–1,294) is evaluated.

Results and Discussion

In terms of GDPPC it can be stated that the maximum values and the middle values (arithmetic mean and median) show inequality (3):

$$for\ GDPPC: PU > IN > PR \tag{3}$$

However, the minimum values indicate an ambiguity of such a conclusion. In this parameter (minimum GDPPC) the regions IN and PR are equal, as shown by Table 1. It is interesting that five NUTS 3 reached this minimum value: four from Bulgaria (BG311— PR type,

BG325— PR type, BG342— IN type, and BG425— PR type) and one from Romania (RO216— PR type).
However, it is necessary to take into account the GDPPC max outlier of the PU type (UKI11 — Inner London); therefore, the median value appears to be more adequate for the assessment of the result than the mean value. It is also worth mentioning that the PR type has a different distribution of regions according to the GDPPC, and as the only region of the three types, it has median of a higher value than the arithmetic mean.
Variability parameters in the form of standard deviation and variation range show similar inequality as in (3). However, the relative measure of variability —coefficient of variation — points not only to the strong similarity of all three types of regions, but also to the equality of this parameter for the PU and PR types; IN type has a slightly lower GDPPC coefficient of variation.

Table 1 Selected statistical characteristics of different types of NUTS 3 regions

NUTS 3 type	PU		IN		PR	
Indicator	GDPPC*	API	GDPPC*	API	GDPPC*	API
max. value	164,100	2.56	108,900	2.93	61,400	3.06
min. value	6,500	0.35	2,600	0.48	2,600	0.12
arithmetic mean	29,632	1.17	24,690	1.37	19,807	1.38
median	27,450	1.11	23,800	1.30	20,750	1.34
standard deviation	15,002	0.37	12,264	0.45	10,016	0.44
variation range	157,600	2.21	106,300	2.45	58,800	2.94
coefficient of variation	0.51	0.32	0.50	0.33	0.51	0.32

* in EUR
Source: authors' own with the use of Eurostat data (2011) (2012)

The second indicator that is captured in Table 1, the aging population index, shows in line with expectations an inequality in terms of the maximum value, arithmetic mean, and median parameters as follows (4):

$$for\ API: PU < IN < PR \qquad (4)$$

But even here the minimum value is not in line with the other parameters, which means that the PR type regions have the lowest minimum value of API, namely Guiana (FR930).
The AP indicator variability can be described in terms of the standard deviation and variation range as parallel with GDPPC; there is also some analogy in terms of the coefficient of variation (equality between PU and PR types), but with the difference that the IN type regions exhibit a slightly higher coefficient.

Graphic analysis of the GDPPC and API relationship indicate clear differences among the various types of regions, as shown in Figures 1, 2, and 3, which not only depict the positions of the individual NUTS 3, but also, after the removal of outliers, indicate the area that is covered by a given type of region in terms of evaluated parameters.

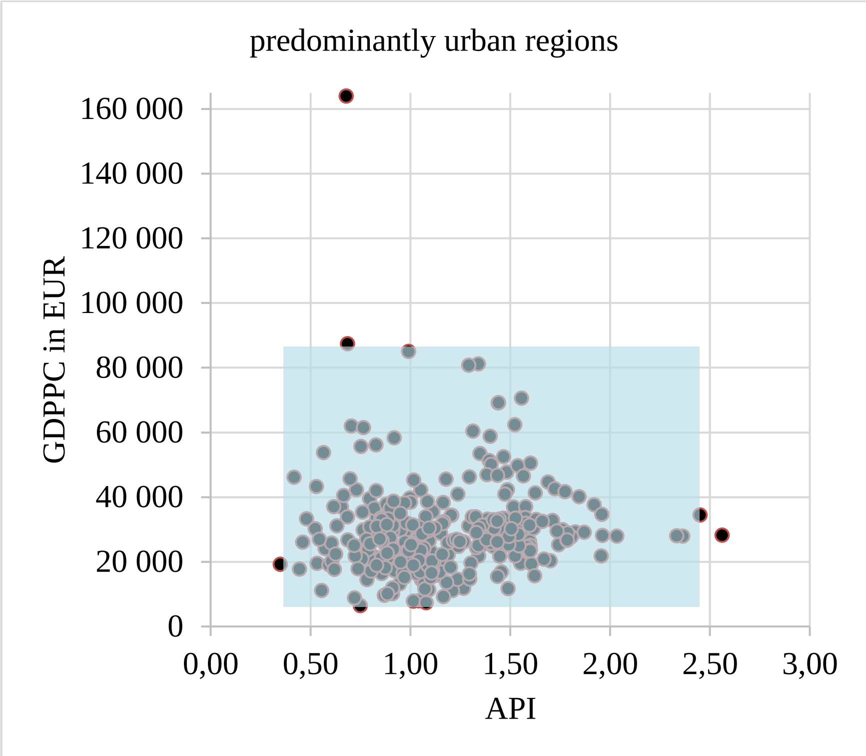

Figure 1 Distribution of the PU type NUTS 3 regions in terms of GDPPC and API
Source: authors' own with the use of Eurostat data (2011) (2012)

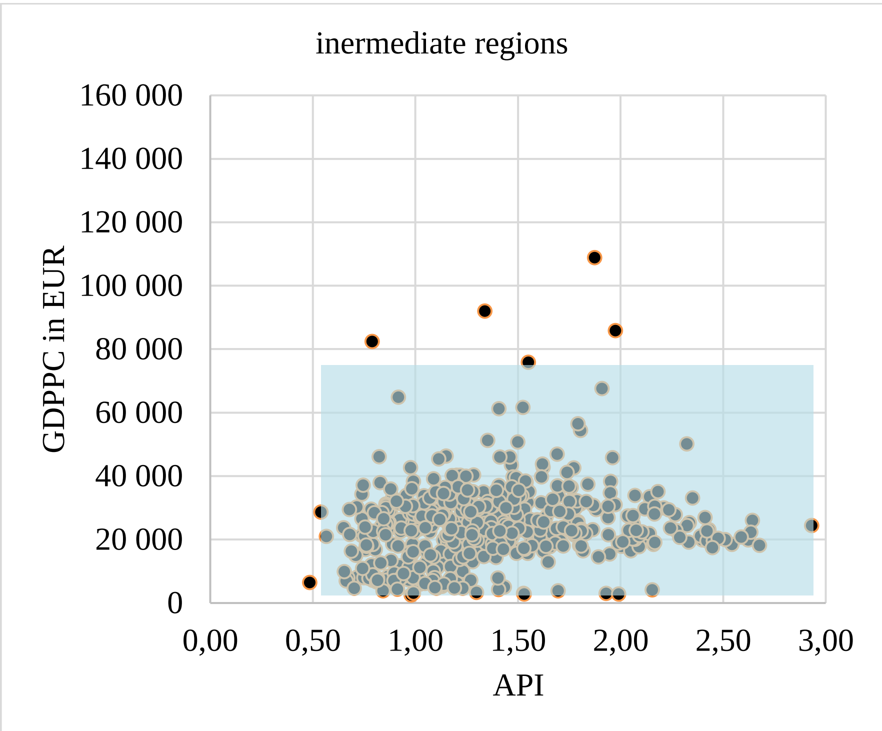

Figure 2 Distribution of the IN type NUTS 3 regions in terms of GDPPC and API
Source: authors' own with the use of Eurostat data (2011) (2012)

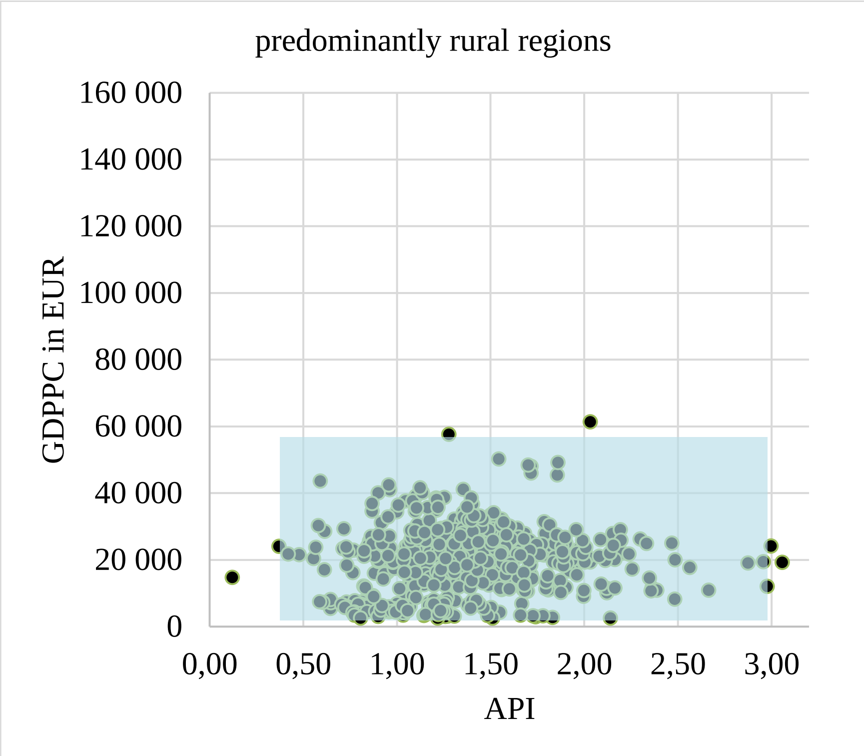

Figure 3 Distribution of the PR type NUTS 3 regions in terms of GDPPC and API
Source: authors' own with the use of Eurostat data (2011) (2012)

The shape and location of rectangles containing occurrences but excluding outlying values, confirm the assumption that PU regions are characterized by higher GDPPC values and lower API values when compared with rural regions. While the PU rectangle is positioned more toward the left side of the graph (lower API values) and higher up (higher GDPPC values), the rectangle for PR regions is much flatter and positioned more towards the lower middle part of the graph. At the same time thanks to the graphical analysis there is a noticeable similarity between IN and PU regions in terms of the GDPPC parameter — although the rectangle in Figure 2 is positioned lower down; in terms of the API parameter there is a similarity of IN regions with PR regions — although the rectangle in Figure 2 is positioned more to the right. The merged comparative graphical view in Figure 4 is completed with a rectangle area calculation (Si) for each of the different types of regions. The graph shows that IN regions occupy the largest area, followed by PU regions and, with considerable distance due to the differences in the GDPPC parameter, by PR regions:

S_{PU} (excluding 2outlying values) = |0.35 - 2.45|/0.5* |87500 - 6500|/20000 = 17.017
S_{IN} (excluding 5 outlying values) = |0.54 - 2.93|/0.5* |75900 - 2600|/20000=17.534
S_{PR} (excluding 3 outlying values) = |0.37 - 2.98|/0.5* |57700 - 2600|/20000=14.358

(Note: the criterion for determining an outlier as an intersection of the two parameters and its subsequent exclusion from the rectangle is the fact that there is only one such value in the specific field of the grid.)

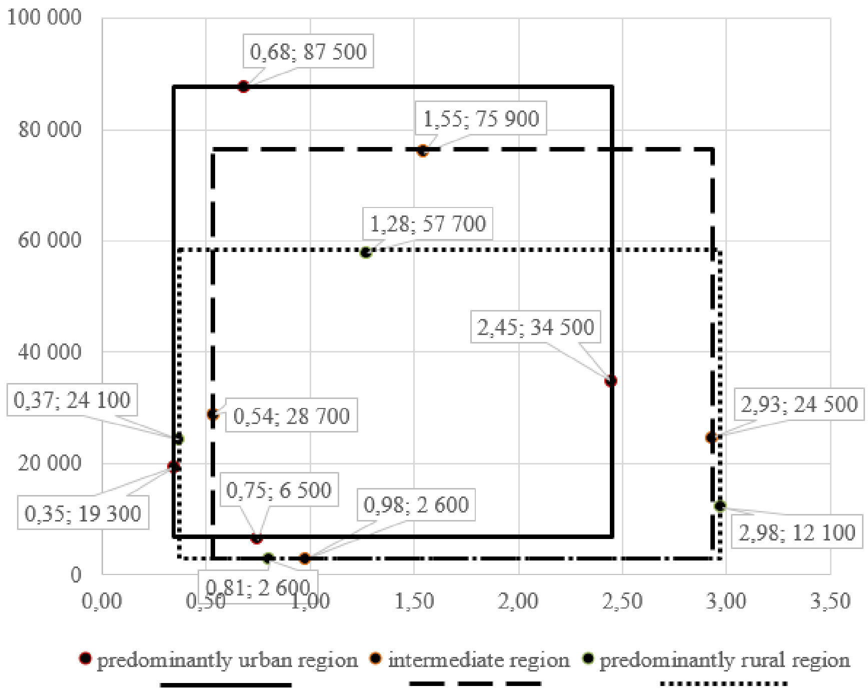

Figure 4 Comparison of rectangle areas containing intersections of the evaluated parameters for each type of regions

Source: authors' own with the use of Eurostat data (2011) (2012)

The last part of the analysis is concerned with the verification of hypotheses. The results of ranking and interval distribution of regions in terms of GDPPC are presented in Table 2, in terms of API in Table 3.

Table 2 Degree of representation of the different types of regions in given intervals in terms of GDPPC

Intervals	Degree of representation of the regions in percent			Total
	PU	IN	PR	
1–306	39.2	41.5	19.3	100.0
307–798	22.2	39.4	38.4	100.0
799–1294	15.5	34.5	50.0	100.0

Source: authors' own with the use of Eurostat data (2011) (2012)

It is apparent from Table 2 that the degree of representation of the PR type regions in the first interval is below 20% as expected, while the representation of the PU type regions in the last interval is also below 20%. The first stated hypothesis is therefore confirmed. It is also noteworthy that the last interval contains a full 50% of the PR type regions. Unexpectedly, however, the first interval is dominated by IN regions instead of the expected PU regions in terms of the highest GDPPC values.

Table 3 shows the representation of NUTS 3 regions in the intervals following the upward ranking according to API.

Table 3. Degree of representation of the different types of regions in given intervals in terms of API

Intervals	Degree of representation of the regions in percent			Total
	PU	IN	PR	
1–306	35.6	35.3	29.1	100.0
307–798	22.4	37.6	40.0	100.0
799–1294	17.5	40.1	42.3	100.0

Source: authors' own with the use of Eurostat data (2011) (2012)

In terms of representation in the first interval with the lowest values of aging based on the API, the PU type regions are predominant, but they are closely followed by the IN type regions. However, the IN type regions also have the second highest representation in the last interval that contains regions with the highest values of aging. In this last interval, the PU type regions do not exceed in terms of their occurrence the expected 20%. Although the PR type regions dominate the last interval, the degree of their representation in the interval with the lowest API values exceeds the considered 20%; therefore, the second hypothesis is not confirmed.

Conclusion

In agreement with the conclusions of the previous studies, which were mentioned in the introduction, we can also say that the presented analysis focused on the comparison of the three basic types of regions — predominantly urban, intermediate, and predominantly rural — as defined within the European Union, shows that there are some differences in terms of the two analyzed indicators, namely gross domestic product per capita and aging population index. The basic statistical characteristics rather support an acceptance of the assumption that urban regions are more productive compared to rural regions and have a lower old age index. However, only the hypothesis regarding the relationships between rural and urban regions in terms of gross domestic product per capita, thus performance, was confirmed within the specified condition. The indicator of aging populations shows that a significant percentage of rural regions fall within the first interval derived from the applicable EU typology, which represents about the first quartile with the lowest aging population index.

Therefore, the question posed in the title of this article can not be answered affirmatively. However, this does not mean that the conclusion may not have implications regarding the direction of the EU regional policy, or the tools for its implementation. With regard to the distribution of individual regions by type in terms of the aging population index, it is apparent that this problem affects a number of urban regions as well. For example, in the last hundred of NUTS 3 regions with the highest age index, which starts with API = 2, i.e. two 65+ people against one person under the age of 15, there are 5 predominantly urban regions, 54 intermediate and 41 predominantly rural regions. It is the intermediate type of regions that may be associated with latent problems (low productivity vs. high rate of population aging). This has also been highlighted by the results of this analysis.

The tools that aim at achieving the EU regional policy goals, especially those that prefer to focus on smart specialization, the search and use of region's specifics, those that allow an increase in Ehrlich PAT or sustainable development in all its aspects, but also those that will prevent an exclusion of individuals or groups of people in a safe environment, must be selected and applied in such a way that their socio-economic efficiency can be proved.

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