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A Methodological Framework for Evaluation of Rural Settlements: Rural Index of Serbia

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Abstract: The lowest administrative-territorial unit in Serbia is a settlement, whereby the administrative criterion of dividing settlements into "urban" and "other" is inadequate for describing the rural area, which is extremely differentiated in Serbia due to various factors. Therefore, it is necessary to determine the typology of settlements in accordance with different development characteristics, with a special emphasis on areas that are lagging in development. The goal of this research is to present a rural index of Serbia. The importance of this research is reflected in the methodological improvement of the classification of rural settlements in Serbia. This approach indicates the development potential and limitations of local areas in Serbia, which is the basis for support and financing of local development programs. The results point to different categories of rural settlements: rural settlements heavily influenced by the urban center; transitional rural settlements, i.e., rural centers; socio-economically devastated rural settlements; "retired", abandoned, disappearing rural settlements, where it is necessary to adapt strategies and policies to different types. The results of the research provide important information to policymakers where specific development strategies for different types of settlements are proposed.

Keywords: rural index; rural settlements; Serbia

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1. Introduction

Serbia's rural areas are undergoing considerable spatial-temporal change. Serbia has a relatively high level of rurality [1]. The rural development of Serbia is additionally burdened by long-term political and cultural marginalization, as well as the spatial-demographic and economic devastation of villages and agriculture, which in many local areas has passed the critical point when it is difficult to reverse unfavorable development tendencies [2]. One of the main problems of local communities is inadequate institutional support, i.e., capacities for implementing certain measures and strategies (limited human resources, lack of legal frameworks, insufficient experience, and the problem of decentralization) in Serbia [3]. To prevent further regional disparities, Serbia should ensure equal opportunities for residents of rural areas, as well as accessible education, health care, and other services. Additionally, strong social cohesion and concrete policy measures should contribute to the reduction of poverty and social exclusion. For rural development policy, the participation of local communities and recognition of regional specificities, as well as knowledge of local conditions, is the starting point for formulating a comprehensive development strategy [4]. Monitoring local development requires an adequate classification of local territorial units. Abreu et al. [5] indicate the lack of measurement of rural territorial units in practice by the level of their rurality, which hinders an adequate assessment of the impact of public policies, which are applied in a certain territory; that is, the identification of areas where the use of public funds would be more efficient. Identifying different types of rural settlements enables the operationalization of separate agricultural and rural development models, i.e., the adjustment of sectoral policy measures depending on the

typology. According to Fertener [6], settlement typologies represent a useful instrument for the implementation of development programs, i.e., a reference framework for the creation of national and regional development policies. Also, an adequate typology of settlements facilitates the planning and management process, i.e., defining the optimal organization of settlement networks to encourage the overall development of Serbia.

The rurality index is an important tool for measuring rural development and could provide us with valuable information for local planning and the innovation of rural development policies [7]. However, most measures of the rurality index still emphasize proximity to metropolitan areas and population density as the primary components of rurality. Some recent measures of rurality have gone beyond the dichotomous rural-urban divide conceptualization of rural communities because the measure of rurality is important for researchers and policymakers as it influences the identification of at-need populations and study populations; how outcomes of policies, environmental changes, and social disturbance are evaluated; and the distribution of funding and other aid across nations and states [8]. Accordingly, rural planning needs a good understanding of what is rural [9]. The need for rurality research became imperative for policy guidance [10]. For instance, Feng et al. [11] constructed index systems for measuring rurality and regional poverty governance, at which incorporating the perspective of rurality into formulating regional poverty reduction policies is a key breakthrough. The practical dimension of the rural typology results from the fact that each type identified can be assigned, through the recommendations, the respective optimum actions regarding the different goals [12].

The premise of the heterogeneity of rural areas influenced the development of methods for creating rural indices that encompass various characteristics of rurality. In short, rurality as a concept and a measure has developed substantially from the basic dichotomy of otherness (non-urban) to a highly complex measure that includes varied and multitudinous factors using sophisticated techniques and fine-scale data [10]. The first important step in defining the rurality index is the Rurality Index of England and Wales [9], whereby rural areas are categorized from extremely rural areas to extremely non-rural areas. This work provided a clear methodology for a continuous and quantitative measure of rurality and firmly established quantitative measures of rurality as central in geographic and policy studies [10]. After harmonizing the data with changes in the territorial boundaries of settlements, a similar study was later conducted by Cloke and Edwards [13] to replicate the rurality index from 1971 with the Census data from 1981. Also, using data from the 1991 Census, Harrington and O'Donoghue [14] create a rurality index for England and Wales, as a replica of the 1981 index, improving the rurality index by extracting and analyzing two separate key dimensions of rurality: demography and structural dimension. Within this research, the settlements were classified as extreme rural, intermediate rural, intermediate non-rural, and extreme non-rural, where the units classified as extreme rural within the demographic and structural index, as well as extreme non-rural units, are of particular importance. These are the first important attempts to determine the rural area. Today, many attempts to identify and classify rural space have been made in different countries, considering a wide range of indicators and the application of different methods. For example, in Abreu et al.'s [5] research, the rural development index is based on Kageyama's proposal, and it uses a geometric mean within each dimension (population, social, economy, and environment) in order to gather the variables instead of the arithmetic mean, avoiding a substitute effect. On the other hand, Dická et al. [15] and Ocaña-Riola and Sánchez-Cantalejo [16] used Factor Analysis in which Principal Component Analysis is used to extract the most significant factors, to identify rural settlements in Slovakia and Spain, respectively. Prieto-Lara and Ocaña-Riola [17] using the same methodology, updated the results of the rural index in Spain, following the changes in time. Also, in the literature, econometric models are used for the classification of rural areas [18]. For example, Galluzzo [19] used Partial Least Square Structural Equation Modeling (PLS-SEM) to assess in depth the cause-effect relationships among different socio-economic variables towards the rurality in Romania from 1994 to 2016. In recent research, combining methods with the

geographical information system (GIS) is very common [20]. Stanny et al. [21] used methods of linear ordering (the above-zero unitarization sums procedure) to identify the significant heterogeneity of socio-economic rural development in Poland by identifying different types of rural areas and clarifying the existing diversity. Basically, rural typology is based on the classification of the individual values of the indicators into clusters (groups), in which the units belonging to the same group are the most similar [22]. In Serbia, classifications of rural areas are usually at the level of municipalities (Local Administrative Unit-LAU 1), administrative districts (nomenclature of territorial units for statistics-NUTS 3) or regions (NUTS 2) [1,23,24].

Researchers create a rural index for various purposes while enabling the evaluation of the impact of rural programs and policies. Nelson et al. [8] created a new index of rurality called Community Assets and Relative Rurality (CARR) for census block groups in the United States, which consists of the primary components of previous indices and additional measures of assets available in an area. Although the block-group resolution index provides greater clarity on differences across populated places, the author mentions the shortcomings of this approach: first, there are issues with the use of administrative boundaries for delineation across space; secondly, despite the use of up-to-date information, there are still data limitations (such as information on infrastructure); and thirdly, the CARR index does not support sociological and cultural perspectives as no single measure of rurality can fully encompass everything. Li et al. [7] created an index system to evaluate the degree of rurality in China at the county level using national census data between 2000 and 2010 and examined the changing pattern of the rurality index, which makes it possible to see the ongoing considerable spatial-temporal change in rural areas. It was found that, in most cases, the rurality pattern reflects the impact of physical geography, resource endowment, traffic location, territorial culture, economic foundation and socio-economic policy on the rural system effectively. Also, Li et al. [7] indicate that the indicator system for rurality evaluation may be further improved by adopting the indicators reflecting the accessibility, land use, landscape and culture of rural areas. Romano et al. [25] constructed a model which identifies three macro indicators (Social, Economic, and Landscape-related) that are then aggregated, leading to the rural index. The goal of the rural index is to be useful for policy purposes and, in this case, to support EU decision-makers in defining actions aimed at the development of rural areas. Like the previous research, the authors state that it would be useful to consider not only the variables already assessed in their study but also their variation over time to identify the growing/declining trends of differences in identified areas [25]. Zhao et al. [26] developed a multi-dimensional index of rurality and an urban/rural typology for health and social research to analyze urban/rural health disparities. The findings of this preliminary study provide useful insights into the potential benefits of a conceptually rigorous, granular and multi-dimensional index which incorporates characteristics that can differentiate levels of rurality in New Zealand more than existing classifications. Burke and Jones [27] developed a Rural Deprivation Index (RDI) for rural health and social service planning. The model developed in this research gives clarity to the process of populating an index and weighing it for a specific purpose, such as rural deprivation.

In Serbia, the territorial dimension in the creation of rural policy is not indicated in official documents, which is necessary for the future development strategies for these areas [1]. The goal of this research is to present the rurality index of Serbia, to identify rural areas with socio-economic problems. The importance of this research is reflected in the methodological improvement of the classification of rural settlements in Serbia. The lowest administrative-territorial unit in Serbia is a settlement (settlement level in Serbia is comparable to the LAU 2), whereby the administrative criterion of dividing settlements is into "urban" and "other". All non-urban settlements are defined as "other", which indicates the absence of rural settlements in the official statistics of Serbia [28]. This dichotomous division of settlements has been applied since the Population Census of 1981, leaving open the question of a more detailed classification of "other" settlements. In the earlier censuses

(1953, 1961, and 1971), the division of settlements into urban, mixed and rural was used, which enabled a more precise analysis of the process of deracialization and urbanization of Serbian villages [2]. Accordingly, this rural index analysis improves our knowledge of the rural development of Serbia and establishes an index system to evaluate the degree of rurality in Serbia at the local level using national census data. This is significant for better local planning and the innovation of rural development policy.

This paper is divided into five segments. After the introduction, the methodology segment enables a more detailed view of the creation of the rural index. A results segment follows this and a discussion within which research results are linked to existing policies as well as future development strategies. Finally, we present concluding considerations and recommendations.

2. Materials and Methods

Research on rurality conducted in the 1980s and 1990s was pushed along by the development and use of spatial analysis and statistical techniques, particularly factor analysis/principal component analysis (PCA) and GIS [10]. Multivariate statistical analysis is the most frequently used method for this purpose [15]. The advantage of using factorial techniques is that no pre-judgement of the results is required, as the technique itself determines the importance of individual factors (dimensions) within any derived solution [14]. In this study, Factor Analysis is used in which PCA is used to extract the most significant factors. The idea of classifying rural space rests on the creation of a compound index that is the result of the sum of several standardized simple indicators. Briefly, the methodological steps include the following: the application of Factor Analysis to define the factors, and the derivation of the factor score for each factor for each unit of observation. To ensure maximum efficacy, Factor Analysis is based on an appropriate theoretical framework:

- Research FA (R type) was used (based on a defined research problem).
- Performed standardization of data by Z-transformation.
- Performed Bartlett's test and the Kaiser–Meyer–Olkin test [29].
- Correlation matrix (at least 0.3 or higher Pearson correlation coefficient).
- Principal Component Analysis as a factor extraction method was used.
- Kaiser's criterion (eigenvalue greater than 1) [30], with VARIMAX rotation with Kaiser normalization.
- Accepted factor loadings in the range greater than ± 0.50 [31].
- Calculated factor scores.
- The quartile classification was created, ranging from "extremely rural" to "extremely non-rural".

The calculated factor scores enable the summarization of the rurality index, based on the following formula [14]:

$$Ij = a_1x_{1j} + a_2x_{2j} + \ldots + a_nx_{nj} \quad (1)$$

wherein, Ij is the index of rurality for area j; a_n factor loading for variable x_n; and x_{nj} value of variable x for area j. The creation of the rural index of Serbia in this research relies on research of Harrington and O'Donoghue [14], whereby the compound rurality index consists of two key indices: demographic and structural. By monitoring demographic indicators, it is possible to identify the process of rural depopulation, through the decline in birth rates, rural-urban migration, and population aging, while monitoring structural indicators enables the identification of the process of rural urbanization, as well as deagrarianization through the decline of the agricultural population. The Harrington and O'Donoghue Index requires a two-level analysis (two-factor and one-factor solution). A similar study by Dická et al. [15] uses the Harrington and O'Donoghue rurality index to classify rural and non-rural municipalities in Slovakia because it allows for both factors of rurality to be used separately and together. In this research, the two-stage analysis procedure is shown through a matrix diagram (Figure 1):

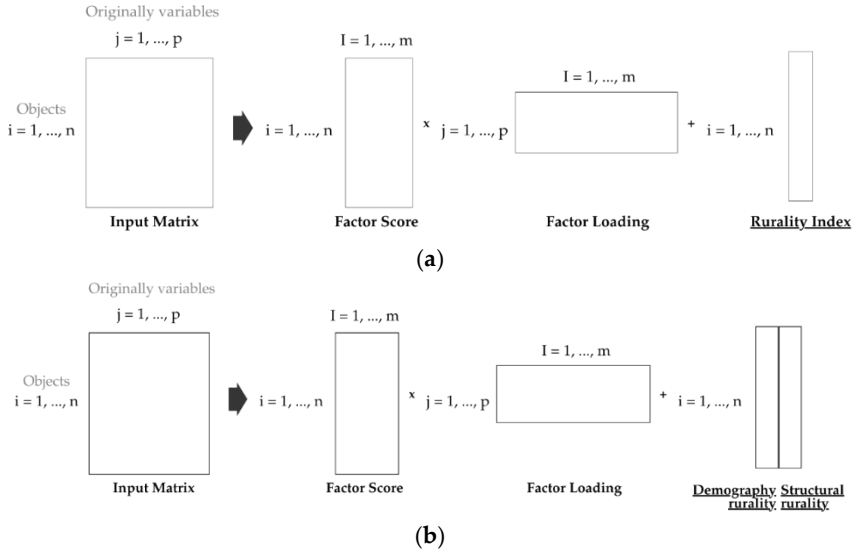

Figure 1. Matrix Diagram presented in research Dická et al. [15]. (**a**) One-factor solution; (**b**) two-factors solution.

A good rural index should be able to aggregate the indicators using objective and statistically verifiable weights [25]. In practice, the availability of databases is a major prerequisite for creating a rurality index. Also, the influence of the selected variables on the result is significant [7], i.e., the weight assigned to each simple indicator can be decided subjectively according to the researcher's criterion or objectively using multivariate analysis [32]. Although we accept the limitations of this approach, we consider that the rural index is useful for understanding rural areas, as well as providing important information for decision makers, which points to the connection between science and rural development policy. To adequately target the problems of rural areas, the variables used in the analysis must be focused on the basic problems of rural areas of Serbia, respecting the need to generate two basic components of rurality: demography and structural characteristics. Initially, 19 variables were defined (Table 1), which can be divided into four segments: demographic characteristics; household structure; economic structure; and quality of life, whereby these variables were included in the initial, trial models of factor analysis, i.e., correlation analysis. The final model should satisfy certain statistical criteria, with a stable factor structure, which will require certain variables to be excluded from the analysis.

Within this analysis, 4438 settlements in Serbia classified as "other" are included (settlements that do not have a single inhabitant, i.e., abandoned settlements, as well as those settlements in which data were not collected during the Census are excluded, and settlements classified as "urban"). Although the approach of excluding urban settlements from the analysis may lead to certain problems (e.g., some urban settlements have lower performance than settlements defined as "other"), there are two reasons for approaching the definition of a model that does not include urban settlements. First, the focus in all analyses is on rural areas and their characteristics, that is, the need to classify "other" settlements that are treated as rural according to the degree of rurality; and secondly, the determination of the status of urban settlements is left to the municipal services, based on administrative-legal criteria, and this legally defined unit is not subject to further changes, so inclusion in the model could lead to problems in the interpretation of the results, as well as to the problems of connecting the results with current policies of rural, agricultural or territorial development. The source of the data is the Census of 2011 [33], given that the results of the new Census from 2022 have not yet been fully published, whereby this research should set the methodological framework for the classification of rural settlements in Serbia, which is based on Census results and the possibility of comparing Census results from different years. For research purposes, the statistical data processing program The Statistical Package for the Social Sciences-SPSS Statistics 20.0 was used.

Table 1. Initial variables of the model for creating the rural index.

Theme	Indicators
Demographic characteristics	The total number of inhabitants of the settlement Population growth rate between the two Censuses Youth ratio (share of the population under the age of 15, %) Aging coefficient (share of the population over 65, %) Share of women aged 15 to 45, %
Household structure	Share of households with 1 member, % Share of households with income from pensions, % Share of households with income from social benefits, % Share of households without income, %
Economic structure	Employment rate (share of the economically active population in the workforce, %) Share of daily migrants (economically active population that performs an occupation in another municipality or administrative district, %) The share of the economically active population employed in agriculture, forestry and fishing, % Share of the economically active population employed in the secondary sector, % The share of the economically active population employed in the tertiary sector, %
Quality of life	Apartment occupancy rate (households/apartment) Share of apartments connected to public water supply, % Share of apartments connected to public sewerage, % The share of the population without school education and with incomplete elementary school, % Share of the population with higher education, university, faculty or academy, %

3. Results

3.1. One-Factor Solution

After the correlation matrix and trial models of factor analysis, nine variables were chosen. The one-factor solution combines all variables into one factor, i.e., the factor scores represent the index of rurality. A negative sign in front of the variables aging coefficient, the share of households with pension income and the share of employees in agriculture, forestry and fishing (and a positive sign in front of the other variables) (Table 2) indicate the ranking of settlements from the best rated, i.e., with the highest factor score values (extremely non-rural), to the worst rated, i.e., the lowest values of the score factor (extremely rural). The one-factor solution model explains 50.8% of the total variance, which is at the lower limit of acceptability (over 50%). The result of the Kaiser–Meyer–Olkin test (KMO) is 0.896 (which means that the sample is adequate and acceptable for factor analysis), and Bartlett's test of variance is statistically significant (0.000). The factor scores were classified into four categories based on quartile classification, with the rural index ranking from 4.1 to −3.4.

Factor extraction method: Principal component analysis. Factor rotation method: VARIMAX with Kaiser normalization. Rotation achieved after 5 iterations. Source: The authors' calculations.

"Other" settlements, according to the official classification in Serbia, were ranked from extreme non-rural to extreme non-rural settlements. According to the results, four groups of settlements in Serbia were recorded, namely:

- Extreme non-rural-Rural settlements heavily influenced by the urban center.
- Intermediate non-rural-Transitional rural settlements, i.e., rural centers.
- Intermediate rural-Socio-economically devastated rural settlements.
- Extreme rural-"Retired", abandoned, disappearing rural settlements.

Figure 2 shows the characteristics of each group in relation to the defined variables of the rurality model.

Table 2. Factor loadings for a one-factor solution.

Abbreviation	Variable	Factor
POPULATION	The total number of inhabitants	0.539
YOUTH	Youth ratio	0.741
AGEING	Aging coefficient	−0.886
WOMEN	Share of women aged 15 to 45	0.864
PENSION	Share of households with income from pensions	−0.625
AGRICULTURE	The share of the economically active population employed in agriculture, forestry and fishing	−0.561
TERTIARY	The share of the economically active population employed in the tertiary sector	0.554
WATER	Share of apartments connected to public water supply	0.516
EDUCATION	Share of the population with higher education, university, faculty or academy	0.508

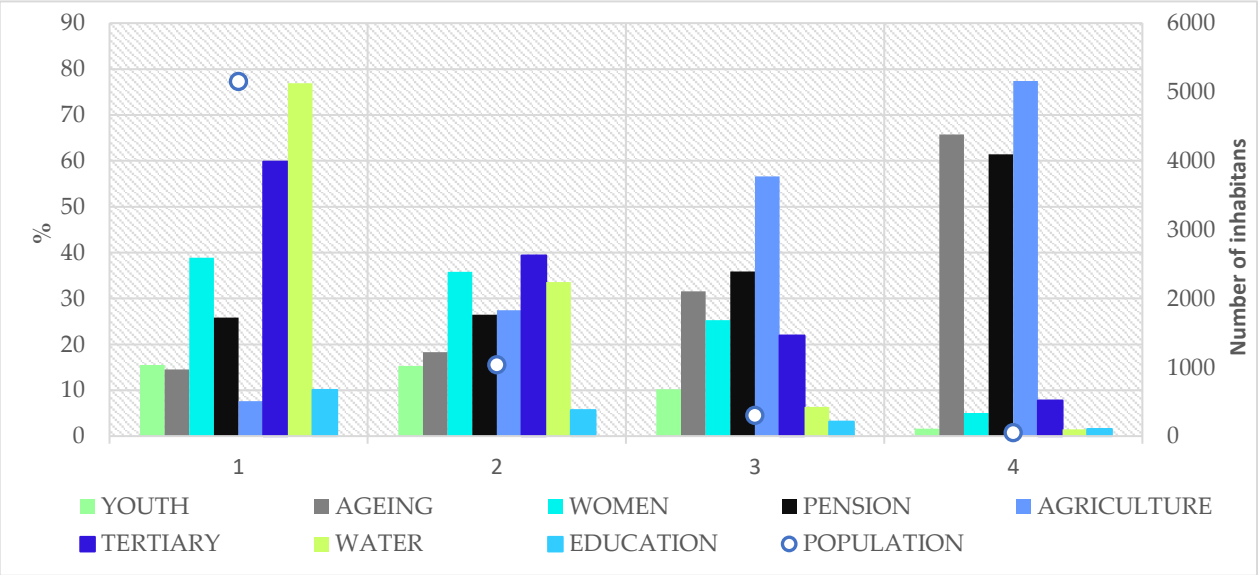

Figure 2. Quartile classification of the rural index. Source: The authors' calculations.

Rural settlements heavily influenced by the urban center. The first group includes 92 settlements, located mostly near large cities (the capital Belgrade and Novi Sad). It is characterized by positive demographic characteristics—that is, these settlements have, on average, almost 60% of employees in the tertiary sector, while this share in the primary sector is, on average, 8%. These are usually settlements that are heavily influenced by cities, where it is possible to find employment outside of the agricultural sector, i.e., the availability of services is adequate, as well as the development of the infrastructure, where the proximity to large urban centers is most often the decisive factor for remaining (the expansion of industrial zones of cities, proximity to important roads, as well as increasing networking and availability of services).

Transitional rural settlements, i.e., rural centers. About 35% of the total analyzed "other" settlements belong to transitional rural settlements. This is a group of rural settlements where certain services are concentrated (primary schools, shops, medical and dental clinics, post office, etc.) and which, due to certain characteristics, have an advantage over the third and fourth groups. The share of employees in agriculture, forestry and fishing is, on average, 27%, while the share of employees in the tertiary sector is 39%, which indicates that these settlements have a mixed economic structure. Considering the size and resources

they possess (natural and human), this group of settlements could achieve a higher level of development with adequate measures of agricultural and rural policy. Unlike the third and fourth groups, transitional rural settlements are ideal for the implementation of agricultural and rural policy measures aimed at supporting non-agricultural activities, i.e., the development of the rural non-agricultural economy, the development of new businesses and entrepreneurship in rural areas, and support for young people in these areas. The application of local development strategies (LEADER approach) is significant for this group of settlements due to the possible greater engagement of the local community (younger, more qualified personnel).

Socio-economically devastated rural settlements. This group includes 2338 rural settlements in Serbia, which is 53% of the total analyzed "other" settlements. Given the dominant share of this group, they represent a key challenge for Serbia's rural policy. The average number of inhabitants of the third group is 305 inhabitants. On average, the share of employees in agriculture, forestry and fishing is 57%, while that share in the tertiary sector is 22%, which indicates the importance of agriculture in the economy of these areas. This group of rural settlements is characterized by less developed infrastructure, and they are more common in hilly and mountainous areas. A smaller number of inhabitants indicates a lower availability of communal infrastructure services. The educational and age structure in these rural settlements are key factors that prevent further development, that is, they prevent modernization, the creation and implementation of local strategies, as well as the introduction of innovations by local communities. Given the great importance of agriculture, it is necessary to enable the survival of these rural settlements through measures of agricultural and rural policy, primarily through measures to improve the competitiveness of agriculture, through investments in agricultural production, strengthening of agricultural associations, risk management, easier access to loans, as well as investing in additional activities on the farm in terms of adding value through processing, marketing. Namely, agricultural (most often family) farms are the main subjects of the development of such rural areas, where it is necessary to enable the realization of an adequate income by engaging in agriculture. The role of the agricultural advisory service in these areas is particularly important. In addition, it is necessary to provide these rural communities with basic services, through village reconstruction measures, to stop the furvether outflow of residents and ensure the basic existence of the current population.

"Retired", abandoned, disappearing rural settlements. The last group is represented by small settlements (with an average of 41 inhabitants), which are rated the lowest in terms of their demographic and structural (economic) characteristics, i.e., these are economically and socially completely devastated rural areas. This group includes 373 settlements, and the big question is how many of these settlements will be defined as having no inhabitants according to the results of the new Census (40 rural settlements have up to 5 inhabitants, where most of the inhabitants are over 65 years old). Measures of state support in these settlements should focus on helping the remaining population. In addition, serious national, regional, and local self-government strategies related to the natural resources of these areas (land, forests, and water) are necessary, i.e., preservation and protection of areas of high natural value, as well as all cultural heritage that remains in these areas.

Figure 3 shows the territorial distribution of different groups of settlements, aggregated to the NUTS 3 level in Serbia. Serbia "suffers" from regional imbalance, especially in relation to the capital city—other regions, e.g., north-south [34]. It is noticeable that the first group of settlements is the most dominant in the Belgrade region. These are quite expected results, considering the "expansion" of the capital and the advantages of the settlements that fall under this district. From the perspective of the location of this group of settlements, it is important to note that they are present in all regions of Serbia, and of the total number of settlements of the third group, they are most represented in the regions of Western Serbia and Šumadija. Within the third group, 50% of rural settlements are in Western Serbia and Šumadija, and 45% in Eastern and Southern Serbia. That is, this type of settlement is dominant in the structure of these areas of Serbia. There are no rural settlements in the

north of Serbia (Vojvodina and the Belgrade region) within the fourth group, while 79% of this group are settlements from Eastern and Southern Serbia. The marginalized border areas of Serbia in these regions are most affected by the processes of depopulation and abandonment of villages.

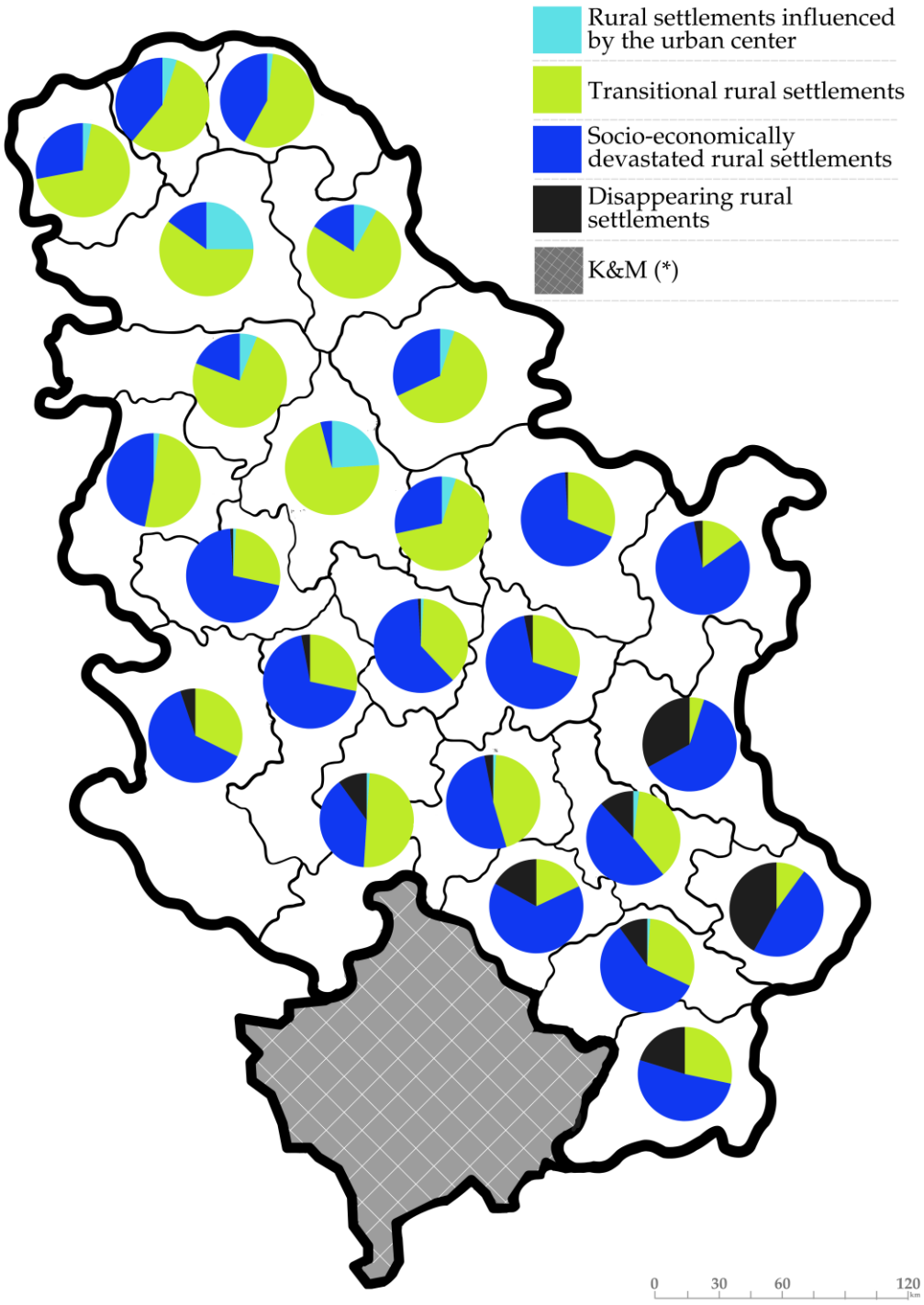

Figure 3. The structure of groups of "other" settlements in Serbia, aggregated to the NUTS 3 level. Note: * The specific status of Kosovo and Metohija (K&M) excludes it from the analysis.

3.2. Two-Factor Solution

Creating a rural index as a one-factor solution can serve to better understand rural space; however, a two-factor solution further deepens the analysis of rurality [14]. Although the one-factor solution in this research explains more than 50% of the total variance

(minimum condition), the two-factor solution provides a higher reliability of the model, explaining 69.1% of the total variance. In Table 3, the factor loadings (accepted values greater than 0.5) are extracted, whereby two key dimensions of rurality are clearly distinguished. It allows for both factors of rurality to be used separately and together. The two-dimensional approach offers a direct method to follow change among districts [15].

Table 3. Factor loadings for a two-factor solution.

Variable	Factor 1	Factor 2
The total number of inhabitants	0.269	0.531
Youth ratio	0.839	0.108
Aging coefficient	−0.898	−0.274
Share of women aged 15 to 45	0.873	0.279
Share of households with income from pensions	−0.862	0.120
The share of the economically active population employed in agriculture, forestry and fishing	−0.067	−0.858
The share of the economically active population employed in the tertiary sector	0.051	0.869
Share of apartments connected to public water supply	0.175	0.574
Share of the population with higher education, university, faculty or academy	0.091	0.669

Factor extraction method: Principal component analysis. Factor rotation method: VARIMAX with Kaiser normalization. Rotation achieved after 5 iterations. Source: The authors' calculations.

The rurality index is decomposed into two indices: the demographic index and the structural (economic) index. Both indices are divided into four groups by quartile classification depending on the index value. The demographic index ranges from 4.0605 to (–4.5996). The results of the demographic index indicate that the settlements from the first group are the settlements that have the most favorable demographic situation. By moving from the first group to each subsequent one, the demographic situation worsens, whereby the settlements that fall into the fourth group are settlements in Serbia that are faced with serious demographic problems: depopulation, aging of the population, declining fertility and a large proportion of elderly households. That is, in the fourth group, there are settlements with an average of 77% of the population over the age of 65, as well as 81% of elderly households. The third and fourth groups within the demographic index make up 61% of the total number of "other" settlements, while the characteristics of these settlements are negative demographic trends. Such results point to the importance of defining strategies and directing funds to prevent further demographic decline in rural areas of Serbia. The results of the demographic index are significant, not only for rural policymakers but also for population and social policy.

The second dimension of rurality, namely the structural (economic) index, ranges from 4.3187 to (–2.3012). The structural dimension indicates the economic structure, the educational structure, and the quality of life in rural areas (in relation to the variables that make it up). The first group of settlements is represented by settlements with, on the one hand, the highest average number of inhabitants, the share of employees in the tertiary sector, accessibility to public water supply, as well as the largest share of a highly educated population; or, on the other hand, with the lowest average share of employees in the primary sector. Such characteristics of the settlements indicate that these are settlements under the greater influence of urban centers, with employment opportunities outside of agriculture, as well as better living conditions in those areas. Unlike the first group, the fourth group represents settlements characterized by a small number of inhabitants, which implies that the availability of services, i.e., investment in infrastructure is negligible, as well as the largest share of employees in agriculture, forestry, and fishing (on average

around 80%), which indicates areas that are extremely agricultural, sparsely populated, and affected by serious economic problems. Out of the total number of "other" settlements, a third of the settlements belong to the fourth group of the structural dimension, which is a devastating result for rural Serbia. If the settlements of the third group are added to that, as many as 83% of the settlements in the number of "other" settlements are affected by certain problems in terms of economic development, employment opportunities outside of agriculture, availability of services and the like.

4. Discussion

According to the Spatial Plan of the Republic of Serbia [35], the main problems of rural areas of Serbia are the marginalization of villages, stagnation and declining vitality of rural areas and the rural population, which causes the following problems in relation to urban areas: depopulation, lower level of infrastructure, disturbances in the spatial and residential structure, stagnation of economic competitiveness of rural areas, damage to the ecological integrity of rural areas, lack of appropriate institutional and organizational support for rural development. One of the biggest social problems in Serbia is the rapid reduction of the rural population, which exceeds the pace of the reduction of the agricultural population and the total population as a whole; that is why it is necessary to plan the development of agriculture and villages (the so-called agricultural and rural development) based on demographic development [2].

Depopulation is basically a local phenomenon, considering that the devastated area becomes a problem for local communities. However, it is necessary to look at the broader context of this process, considering that it significantly affects regional, national and even global interests [36]. Policymakers should take adequate measures in relation to population policy, to reduce rural migration, primarily from border, hilly and mountainous areas. The decrease in the number of inhabitants triggers the adjustment of existing land use policies and plans, whereby the institutions in local self-governments responsible for development planning form the basis for new spatial development [37]. Strengthening industry in these areas, primarily industry based on natural resources, investing in local businesses, and investing in rural tourism, would reduce the outflow of the young population. Merino and Prats [38] state that the problem of depopulation of rural areas is an important issue for EU countries, whereby the EU's rural development policy, which is financed through the European Agricultural Fund for Rural Development (EAFRD), is an important segment of solving the problem of depopulation. Namely, the goal of the Common Agricultural Policy (CAP) of the EU is exactly the balanced territorial development and economic convergence of rural areas [39]. According to Merino and Prats, in the period from 2014 to 2020, 100 billion euros were financed through the EAFRD, whereby these funds should have been adequately invested primarily in the infrastructure of rural areas in order to increase the quality of life of the rural population, but also the promotion of various economic activities (e.g., tourism) to diversify the income of the population in these areas, with the fact that the influence of efficient management of local self-governments in the allocation of budgets and financing of development projects in devastated areas must not be neglected. An example of the impact of the EU's CAP on reducing depopulation is the research by Galluzzo [19,40] covering rural depopulation in Romania. Namely, Galluzzo indicates the importance of CAP in protecting rural areas of Romania from socio-economic marginalization and depopulation, primarily in the border areas of this country, through investments in the diversification of agricultural holdings, primarily through agritourism, craft shops, and processing capacities. Financial aid and subsidies to rural areas in the direction of creating new jobs by local companies are a significant segment of the development of these areas. Improvement of rural development in Serbia can be influenced by a stronger connection of agriculture with tertiary and secondary sectors [41]. The development of the rural non-agricultural economy has a significant impact on the absorption of surplus labor; acceleration of the overall economic development of rural areas; and improving the quality of life due to the variety of products and services available

to rural areas [42]. Positive examples in EU countries should serve as benchmarks for the creators of population, agricultural, i.e., of Serbia's rural policy, in future strategies to prevent further migration between the countryside and the city, mainly in the strengthening of settlements affected by negative demographic trends.

It is necessary to adjust support measures depending on the type of rural areas, given that rural settlements with a more favorable demographic and economic situation can more adequately respond to certain challenges. Development proposals for a defined classification of rural settlements in Serbia include:

- For the first group of settlements (light blue color in Figure 3), which have adequate human capacities (educated, professional, and young population), it is necessary to initiate the development of those settlements or to define certain local strategies which public funds would support. Due to their location, these rural areas represent areas that could record migration from the city to the countryside because they are close to urban areas, and the cost of living is lower. Some key development recommendations are improving connectivity with cities through an integrated public transport system. Given the adequate human resources, it is necessary to invest in support for entrepreneurship and small businesses, primarily through the third axis of Serbia's rural policy, which includes funds for the development of the diversification of the rural economy (investment in rural infrastructure, rural non-agricultural economy, and developing new businesses). Also, a significant segment of the development of these settlements lies in other policies, such as digitization and development of telecommunications in these areas, planning the city's urban expansion, with the aim of preserving green areas and rural traditions. The Serbian government has limited opportunities to invest in private activities. However, significant potential lies in the implementation of measures such as the establishment of integrated public transport systems and the construction of infrastructure.
- The second group of settlements (green color in Figure 3) are the bearers of rural development in Serbia, i.e., rural centers. Considering the characteristics, the key recommendations for this type of settlement include supporting the development of rural businesses outside of agriculture (e.g., tourism, product processing, and handicrafts), whereby the LEADER approach and the development of local development strategies are important. In Serbia, the implementation of the LEADER mechanisms is delayed, while the future directions of rural policy must be aimed at strengthening and encouraging local action groups, building a network of local action groups throughout Serbia, supporting the development of entrepreneurship in rural areas, joining certain groups, which would be ready to create local strategies, as well as their training and technical assistance [43]. The experiences of developed EU countries indicate the importance of this program in developing small villages at risk of socio-economic marginalization. Bjärstig and Sandström [44] state how public-private partnerships (in various forms through the LEADER program, ecological partnerships, and cultural partnerships) have contributed to the sustainable development of sparsely populated, rural settlements in Sweden. Support for young people and education, i.e., training for entrepreneurship as well as innovations in existing businesses (and agriculture through smart agriculture), as well as support for young couples when buying a house in these areas, are especially important for this type of settlement. Considering the need to improve the quality of life in these areas, support for the improvement of local schools, health centers, and cultural centers is also necessary.
- For the third group of settlements (blue color in Figure 3), where there is an inadequate demographic situation and an insufficient level of economic sustainability, it is necessary to enable the further functioning of the population, i.e., to keep the population in those areas; with the provision of rural infrastructure, an adequate level of basic services (reconstruction of roads, access to water, and improvement of communal services); and investments in strengthening agriculture itself, as the main activity. To provide full support to these settlements, the key recommendations are to provide sub-

sidies for small and medium-sized agricultural producers, who make up the majority in Serbia, as well as provide certain tax incentives for investment in these rural areas. Considering the age structure of this group of settlements, it is necessary to enable training and provide support to the elderly population in starting new businesses, such as crafts or local tourism. Networking of local self-governments through regional and local development projects would solve certain specific problems. In this way, the available human and financial capital in solving common interests would be increased (e.g., infrastructure development in hilly and mountainous areas, protection of cultural assets, environmental projects, projects focused on the availability of services in rural areas, training and continuing education of farmers, and women's association projects in the countryside).

- For the fourth group of settlements (black color in Figure 3), the cooperation of politicians, especially Serbia's agricultural and social policies, is necessary to enable the remaining population to survive. The key recommendations include different social programs for all vulnerable population groups in rural areas (elderly, women, etc.). That is, it is necessary to ensure basic social and health services for the elderly population. In addition to the focus on population, it is extremely important to create adequate ecological strategies for the natural resources that remain in abandoned rural areas after emptying those villages, considering that depopulation in these settlements is unstoppable. This type of settlement faces problems that are often caused by natural limitations, such as settlements in mountainous areas. In the EU, there is support for such areas (Areas with Natural Constraints—ANCs), whereas in Serbia, such support is absent [43]. Basically, Serbia's rural policy does not recognize areas that have certain natural limitations. The EU's approach to ANC areas can serve as a model for Serbia's rural policy, enabling incentives for agricultural activities in such areas and investing in the preservation of biodiversity and sustainable use of land and other natural resources that remain abandoned. Such support would enable investment in ecotourism and organic production. Also, an important segment of support for these settlements lies in supporting the preservation of cultural heritage and tradition (preservation of traditional village houses and old crafts).

5. Conclusions

The created rural index of the settlements enables the identification of different degrees of rurality. The proposed classification of settlements enables the adjustment of measures and instruments for Serbia's agricultural and rural policy, which is significant considering the limited financial capacities of the agricultural budget. Accordingly, it is possible to define different strategies, which, depending on the type of settlement, would give the best results.

It is necessary to achieve integrated rural development with an elaborate and efficient system of cooperation between policymakers at the national, regional, and local levels. Strengthening local self-governments in the decision-making process is a key task in the future. The process of decentralization in Serbia requires certain radical reforms and is inevitable for the overall social development of Serbia. In addition, public-private partnerships and the involvement of local communities in the process of creating projects for the development of a certain territory are gaining more and more importance in the EU. This approach becomes dominant in the creation of rural development strategies, which indicates the need to strengthen it in Serbia as well.

The complexity of rural development indicates the need for multisectoral action in these areas. The coherence of Serbia's agricultural and rural policy with social policy is significant from the aspect of social protection of established categories of the population in rural areas and is especially dominant in areas affected by certain development problems. Also, due to the large problems of depopulation of villages in Serbia (especially the border parts of Eastern and Southern Serbia and hilly and mountainous areas), it is adequate to create certain ecological strategies for the protection of natural resources that remain

abandoned in these areas. To initiate the development of the rural non-agricultural economy, cooperation with other sectors of the economy (infrastructure, tourism, and services) is necessary.

The goal of this research is to point out the need to define rural settlements and to target the key carriers of rural development in Serbia. Inadequate administrative categorization of settlements into "urban" and "other" makes it impossible to create adequate plans and policy strategies (rural, regional, population, social, ecological, and similar). The limitations of this research are reflected in the unavailability of data from the new Census in its entirety. Future research will move in the direction of creating an index of rurality based on the new results of the 2022 Census (when they are fully available), as well as comparing the results of the two, which will make it possible to see the change in the rural pattern—that is, the spatial-temporal change of rural areas of Serbia. Also, the inclusion of dynamic variables, such as migration balance, would significantly improve the overview of the current state of rural Serbia. Therefore, future research will include dynamic indicators.

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