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A NEW DEFINITION OF 'RURAL AREAS' FOR THE METROPOLITAN CITY OF ANKARA, TURKEY

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Abstract

The aim of this study is to create a new definition of 'rural area' for the metropolitan city of Ankara in Turkey by developing a rural index. Two models are employed in the paper. One of them is a logit model which identifies the factors affecting population density, and the second one is principal component analysis. The variables used in this study are population density, the number of businesses, the number of summer cottages, the proportion of the population with university degrees, total asphalt roads, the distance to the nearest administrative centre, the number of agricultural holdings, total agricultural land and the number of points of interests (banks, pharmacies, schools, etc.) for each neighbourhood. According to the principal component analysis, classifications are made at three levels: urban quarter, intermediate quarter and rural quarter. This analysis is made on the basis of existing data at the level of the neighbourhood. There is an important drawback of this study: it does not include data regarding income levels of the people since there was no data at the neighbourhood level. But with 10 variables, this study is quite sufficient for defining the rural and urban Ankara, including socio-economic and spatial characters of neighbourhoods.

Keywords: Metropolitan, Rural Area, Rural Index, Urbanization, Ruralism

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INTRODUCTION

With depopulation of rural areas, the existing definitions of rural areas that consider only population have lost their validity. While some rural areas turn into peripheries of urban areas, others continue to be rural with regard to agricultural activities, natural land, etc. Not only is the definition of rural areas differentiated among countries but also within the same country (Gist and Fava, 1966). For instance, the rural area is defined by the census bureau of the United States as encompassing all population uses a different definition from the Office of Management and Budget which sees rural areas as open countryside and settlements with fewer than 2,500 residents[2]. Population density is widely accepted by many countries. One view, expressed by Dewey (1960), is that the number of settlements, the density of a settlement and the degree of heterogeneity are necessary for the rural definition. Hoggart (1988) shows that using population density alone yields only average figures but does not depict the rural areas or give much information about the nature of rural communities.

An important variable for measuring rurality is distance. Haynes and Bentham (1982) highlight that hospitals tend to be in larger towns rather than small towns. They drew attention to agriculture in the rural areas. When people were asked about their perceptions of rural areas, one of the first responses was related to agricultural practices. According to Weiners and Boik (1995), the word 'rural' evokes some images of corn fields, desert landscapes and plantation mansions. An alternative view/suggestion is that rural areas need to be classified as rural areas with farms or without farms (Lee, 1991).

The OECD (2012) defines rural areas as the places that have local units with less than 150 inhabitants per km^2 while the EU accepts a new typology. According to this typology, a population density threshold (300 inhabitants per km^2) is applied to grid cells of 1 km^2, and a minimum size threshold (5,000 inhabitants) is applied to grouped grid cells above the density threshold (EUROSTAT, 2020). Apart from these definitions, Hoggart (1988) pointed out five variables for defining rural areas: a low population density, loose networks of infrastructure and services, tight networks of personal contacts and a strong identity with home localities, below-average manufacturing and office-based employment, and a landscape dominated by farm land and forestry. A similar stance is taken by Haynes and Bentham (1982) and Pateman (2011). They stress the need to use a few features rather than accepting only one. In this sense, one of the widely accepted methods to cover all these variables is Cloke's (1977) index of rurality, which is based on a multivariate analysis of some socio-economic indicators.

This study aims to develop a new definition of rural areas in Turkey. In this framework, Ankara was selected as a pilot province by choosing some available socio-economic variables at the regional level. A logistic regression was used in order to find the factors affecting the population size at the neighbourhood level. A principal component analysis was used in the model that covers the variables of population size, the number of businesses, the proportion of the population with university degrees, the distance to the nearest administrative unit and the population density. Classifications were made at three levels: urban quarter, intermediate quarter and rural quarter.
This paper has five main parts. After a short introduction, the second part of the paper consists of a literature review. The following part includes the material and methods of the study. The results exposing the degree of rurality are presented in the fourth part, and finally, the study ends with concluding remarks.

LITERATURE REVIEW

Where rural areas start is an important issue in social and urban literature. Although it was considered sufficient to take the size or density of the population into consideration, a more sophisticated index, including rural population density, specialization and commercialization of agriculture, per capita income, the nature of land holdings and local private transportation facilities, is needed (Stewart, 1958). Jones (1955) suggested a variety of variables: population dispersion, economy, occupations, social differentiation, social stratification, social solidarity and social interaction. Rousseau (1985) stressed that population density correlates well with definitions made of socio-economic variables. She also emphasized that the definitions solely based on population density render average figures and cannot give the exact status of rural areas. Gist and Fava (1966) thought that size, density and legal community status could be associated with socio-economic behaviour. In the literature, the definition of rural areas varies from statistical (Cloke, 1977; Cloke and Gareth, 1986; Riola and Carmen, 2005) to administrative regions (Lassey, 1977) and from population size/density (Fothergill et al., 1985) to functional regions (Coombes, et al., 1982). It can clearly be said that no standard definition is accepted by countries. A definition based on agriculture is also widely accepted in the literature. Wirth (1938) took the stance that rural areas are characteristically defined by farms, manors and villages. The idea was taken further by Gist and Fava (1966) who said that a peasant community could be considered mainly as a rural expression. In the same way, Pizzoli and Gong

[2] *https://www.hrsa.gov/rural-health/about-us/definition/index.html*

(2007) conclude in their econometric model that population density is not itself a sufficient variable for explaining rurality. It is stated that agriculture in the sense of economic specialization definitely needs to be included in the models (Muilu, 2004; Pizzoli and Gong, 2007). Öğdül (2010) developed an index including the variables of agricultural production, non-agricultural production, employment, demography, education and the flows of money, goods and people. Alternatively, Gajic et al. (2018) used a multivariate analysis that included physiogeographical, socio-economic and functional characteristics. Bucholtz and Cromartie (2008) expressed that an administrative definition should be the starting point for determining what is rural. From a statistical point of view, Cloke and Gareth (1986) created a rurality index consisting of 17 variables. Population density, population change, occupancy rate, mobility, occupational structure, in-migration, second homes, holiday accommodation, distance and household amenities are some of them. Another rurality index was employed by Halfacree (1993) by using a principal component analysis.

With regard to urbanism, Wirth (1938), in his famous essay "Urbanism as a way of Life", stated that urbanism as a way of life can be approached from three interrelated perspectives: 1) as a physical structure comprising a population base, a technology, and an ecological order; 2) as a system of social organization involving a characteristic social structure; and 3) as a set of attitudes and ideas. This is supported by Dewey (1960). He indicated three main variables: size, density of settlement and the degree of heterogeneity. The last variable is one of the most important distinguishing features but very difficult to calculate. Redfield (1947) states that the main features of folk society are that they are small, isolated, nonliterate and homogeneous, with a strong sense of group solidarity.

Paquetta and Domon (2003) differ from others by suggesting a new variable of landscape dynamics. It has been stressed by them that farming populations have declined sharply in rural areas, and the nature of some rural areas attract people to settle in them. The definition of rural areas in some places would not include traditional agricultural activities that are no longer predominant in a large part of the territory. Lastly, Bibby and Shepherd (2005) pointed out three main features for urban and rural classifications. The first is population size, the second is physically defined settlements and the third one is economic separation from land which displays economic diversification.

In Turkey, there are a few studies for rural definition. One of them was made by (Kolars, 1967). In this study, two typologies (urban-directed and rural-directed) were made and each one of them is subdivided. Villages were classified according to a set of characteristics. Under the urban-directed typology, there are four type of villages. These are shadow villages, annexed villages, satellite villages and summer dormitory villages. Under the rural-directed typology, there are three classifications. These are market-seeking villages, market-recognizing villages and market-ignoring villages. A study conducted by SPO (1982) was one of the most significant documents to cover a wide range of indicators in the Turkish hierarchical system. According to this study, the functional structures of settlements in the villages, towns and districts were analysed in detail from the basic population size to migration trends, from infrastructure to marketing. In this framework, the places showing minimum functions of urbanization are considered as cities.

There are two common definitions used for rural areas. The first definition is with regard to administrative regions. According to this definition, all settlement areas, except for the central parts of districts and provinces, are considered rural (The Ministry of Food, Agriculture and Livestock, 2015). The second definition, based on the population size, comes from the Village Law No. 442 that was issued in 1924 which defines villages as places with less than 2,000 inhabitants, and rural areas are considered as places where the population is less than 20,000 (Official Gazette, 1924).

MATERIAL AND METHODS

Pilot Region

Turkey has 81 provinces, 30 of which are great municipalities. Ankara has been selected as a pilot region in order to define what a rural area could be in metropolitan provinces in Turkey. The data used in this study were collected at the neighbourhood level from each district since there is no village unit after the Municipal Law No. 6360 was enacted (Official Gazzette, 2011). Ankara province has 25 districts, 16 of which are located in the periphery while 9 are central districts. The data comes from 1,429 neighbourhoods. Ankara is located in the central part of Turkey with a population of approximately 5.5 million in 2019.

Logistic Regression

Wooldridge (2006) states that using a sophisticated binary response model is simple to estimate and has no disadvantages. The formula for the logit model can be given as follows:

$P(y=1|x|=P(y=1|x1, x2,...., xn)$ (1)

where x denotes the full set of explanatory variables.

$P(y=1|x)=G(\beta0+\beta1x1+....+\betanXn)=G(\beta0+x\beta)$ (2),

where G is a function taking on values strictly between zero and one: 0<G(Z)<1, for all real numbers. In the logit model, G is the logistic function:

$G(z)=\exp(z)/[1+\exp(z)]=A(z)$ (3)

$y^*=\beta 0+x\beta+e$, $y=1[y^*>0]$ (4)

Where y is an unobserved variable and the notation 1[…] is defined as a binary outcome while e is independent of x. The response probability for y can be given as follows:

$P(y=1|x)=P(y^*>0|x)=P[e>-(\beta 0+x\beta)|x]$ (5)

$=1-G[-\beta 0+x\beta]=G(\beta 0+X\beta)$

Principal Component Analysis

Principal component analysis is a multivariate statistical analysis for redefining the variance-covariance structure of a set of p-dimensional variables with as few linear combinations of these variables as possible. The main purpose here is to reduce the number of variables (size reduction) and hence make it easier to comment on the subject that the variables are related to (Johnson and Wichern, 1992). The analysis allows for summarising a large number of features and for releasing the conjunct and fundamental meaning or the core of information contained in a data set. Thus, with the principal component analysis, a large number of interrelated variables are transformed into a smaller group of significant and uncorrelated components.

Data Set

The variables used in this study are population density, the number of businesses, the number of summer cottages, the proportion of the population with university degrees, total asphalt roads, the distance to a nearest administrative centre, the number of agricultural holdings, total agricultural land and the number of points of interest (banks, pharmacies, schools, etc.) in the neighbourhood. The data used in the model comes from TURKSTAT, Provincial Directorate of Agriculture and Forestry of Ankara and BASARSOFT. The data as shown in Table 1 were classified under four main features. These are economic activities, socio-economic structural characteristics, spatial dimensions of social organizations and natural characteristics.

Table 1: The Data Set

Variable	Explanation	Classification
The Num. of Businesses	Differentiation from agricultural activities	Economic activities
The Num. of Agr. Holdings	People actively involved in agriculture and animal husbandry	Economic activities
Population Density	Inhabitants per square kilometres (%)	Socio-economic structural characteristics
The Proportion of Pop. with Uni. Deg.	Having a university degree (%)	Socio-economic structural characteristics
The Num. of Summer Cottages	Location of the cottages	Socio-economic structural characteristics
Total Asphalt Roads	Accessibility (km)	Socio-economic structural characteristics
Distance to the Nearest Adm. Centre	Accessibility (km)	Spatial dimensions of social organizations
The Number of PoI	Accessibility	Spatial dimensions of social organizations
Total Agricultural Land	Agr. total area (ha.)	Natural characteristics

Source: author's own definition

RESULTS AND DISCUSSION

Descriptive Analysis of the Data

The number of observations in Table 2 comes from 1,439 neighbourhoods in Ankara. The mean of the population size of neighbourhoods was found to be 3,715.45. The average age of the population of Ankara is 33.56 years, the proportion of the population with a university degree is 7.2%. The average number of points of interests such as banks, pharmacies and schools is 3.7. The biggest standard deviation appears in the data of total agricultural land. The more it is has become rural, the more it is seen as agricultural land.

Table 2: Summary of Data

Variable	Observation	Mean	Std. Dev.	Min	Max
The Num. of Businesses	1,439	211.79	693.80	0	13,75
The Num. of Agr. Holdings	1,439	15.31	25.89	0	304
Population Density	1,439	3,910.53	8,432.16	0	58,610.38
The Proportion of Pop. with Uni. Deg.	1,439	7.24 %	12.36%	0	57.60 %
The Num. of Summer Cottages	1,439	4.31	15.50	0	313
Total Asphalt Roads	1,439	25.81	29.23	.69	300.22
Distance to the Nearest Adm. Centre	1,439	17.59 km	15.61 km	.05 km	94.32 km
The Number of PoI	1,439	3.67	8.51	0	167
Total Agricultural Land	1,439	7,409.58	12,509.01	0	105,839.3

Source: own calculations based on TURKSTAT, BASARSOFT Database (2017)

Logistic Model

Table 3 exhibits estimation results provided from the logistic model. Our study shows that all the factors except for the number of businesses and total agricultural land have influences on population density. As illustrated, the proportion of the population with university degrees and the number of points of interest were identified by the model to have positively significant impacts on population density, while the number of summer cottages, total asphalt roads, distance to the nearest administration centre and the number of agricultural holdings were found to negatively impact population density. Rural areas have lower population density and more elderly people. Young people prefer to move to cities to find more attractive jobs. It is expected that the percentage of people with university degrees in the rural areas would be very low.

In our model, a one-unit increase in the number of summer cottages at the 95% significance level decreases the population density by 28.5 %. Regarding the proportion of the population with university degrees, a one-unit increase in the number of university degrees raises the population density by 264%. A one-unit increase in total asphalt roads reduces the population density by 72.7 %.

Distance is one of the widely used indicators in the literature. It is normally assumed that rural areas have disadvantages with regard to distance. In our study, we analyse the situation by using an indicator that indicates how far a place is from the nearest administration centre. Hoggart (1988) emphasized the loose network infrastructure when defining a rural area. In his rural index, Cloke (1977) took into consideration the nearest urban centre with a population of 50,000, 100,000 and 200,000. Because the administrative units are different from the UK, the nearest district governorships were considered regardless of population size. It seems that this is practically not feasible in our case. A one-unit increase in the distance decreases the population density by 116.4%.

With respect to agricultural activities, a one-unit increase in the number of agricultural holdings reduces the population density by 18 %. Stewart (1958) highlighted that the crudest distinction between urban and rural settlements is the percentage of residents employed in non-agricultural activities. Another significant variable is the number of points of interest. Riola and Carmen (2005) stated that public amenities such as schools, libraries, etc., are one of the important characteristics differentiating rural from urban. A one-unit increase in points of interest raises the population density by 112%.

Table 3: Logistic Model

Number of obs.=1,439			
F (8.1430)=106.47			
Prob>F=0.0000			
R-squared=0.3733			
Adj. R-squared=0.3698			
Root MSE=6693.9			
Source	SS	df	MS
Model	3,82E+14	8	4,47E+13
Residual	6,41E+14	1,43	44808848.2
Total	1,02E+15	1,438	71101463.4
Dependent Variable: Population Density	**Coef.**	**Std. Err.**	
Constant	5837.13***	369.06	
The Num. of Businesses	.40	.31	
The Num. Of Summer Cottages	-28.52**	11.61	
The Proportion of Pop. with Uni. Deg.	264.15***	18.30	
Total Asphalt Roads	-72.69***	6.57	
Distance to the Nearest Adm. Centre	-116.40***	13.01	
The Num. of Agr. Holdings	-18.10**	7.52	
Total Agr. Land	-.00	.016	
The Number of Points of Interest	111.93***	28.56	
***Indicates significance at 1% level, **at 5% level, *at 10%			

Table 4 shows the collinearity diagnostics of the model. The Variance Inflation Factor (VIF) should ideally not exceed 4 according to the rule of thumb; it is regarded as casting doubt on the estimations of regression analysis if it exceeds 4. As seen in the results given in Table 4, the VIF values of the independent variables range between 1.04 and 1.90, and the mean VIF value is 1.39, which is sufficiently concrete evidence that there is no serious multicollinearity in the model.

Table 4: Collinearity Diagnostics		
Variable	**VIF**	**1/VIF**
The Number of Point of Interests	1.90	0.527692
The Proportion of Pop. with Uni. Deg.	1.64	0.608807
The Num. of Businesses	1.45	0.689407
Total Agr. Land	1.36	0.736560
Distance to the Nearest Adm. Centre	1.32	0.754763
The Num. of Agr. Holdings	1.22	0.820918
Total Asphalt Roads	1.18	0.844668
The Num. of Summer Cottages	1.04	0.962273
Mean VIF	**1.39**	

Principal Component Analysis

Planning rural areas is so important for policy makers, particularly those who make agricultural and health policies. The right measures to be developed by policy makers are to a certain extent depend on a right definition. Using principal component analysis (PCA) yields valuable insights into rurality with the chosen variables. Table 5 gives the loading scores for each component used in the PCA. According to the scores, population density, the number of businesses, the number of summer cottages, the proportion of the population with university degrees and total asphalt roads were found significant since their values are greater than 0.75. The scree plot of eigenvalues can be seen in Figure 1.

Table 5: Variable Loading Score	
Variable	**Loading Score**
Population Density	2.92
The Num. of businesses	1.48
The Num. of Summer Cottages	0.98
The Proportion of Pop. with Uni. Deg.	0.87
Total Asphalt Roads	0.79
Distance to the Nearest Adm. Centre	0.70
The Num. of Agr. Holdings	0.51
Total Agr. Land	0.36
The Number of Points of İnterest	0.36

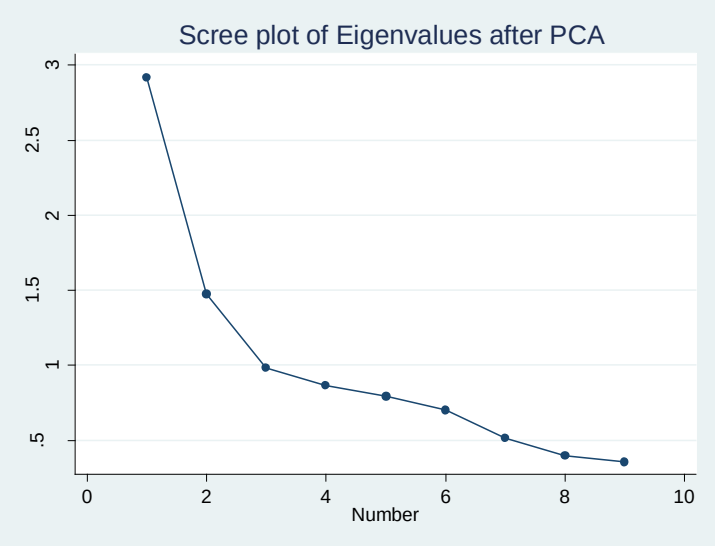

Figure 1: Scree Plot of Eigenvalues After PCA

The rural areas of Ankara are mostly located in the periphery of Ankara. There are 25 districts, of which 16 consist of the periphery while only 9 districts are called central districts with a size limit of 50 km (Ankara Regional Plan, 2014). In our study, 1,439 neighbourhoods in 25 districts were categorized in three classifications. These are urban areas (63.6 %), intermediate areas (5.6 %) and rural areas (30.8 %). The categorization is made on the basis of loading scores in the principal component analysis. The rural areas, urban areas and intermediate areas of Ankara are shown in Figure 2. As seen, the population is highly concentrated in a circle of 50 km.

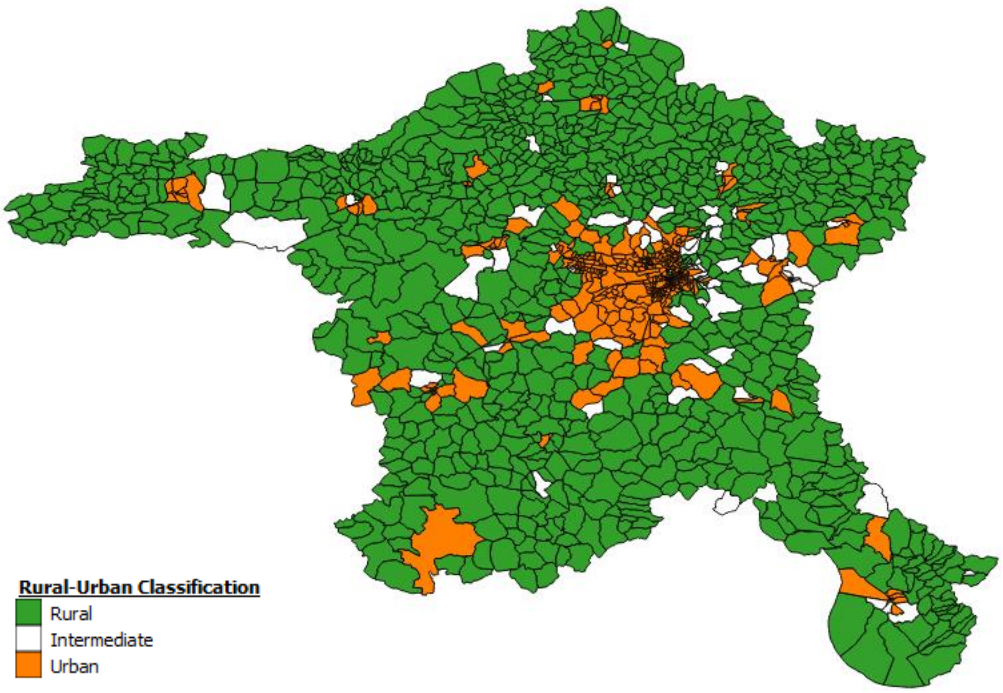

Figure 2: Rural Areas of Ankara
Source: own calculations based on TURKSTAT, BASARSOFT Database (2017)

In the literature, most countries use population density as it is easy to calculate. Figure 3 displays the neighbourhoods of Ankara province according to population size. The current rural definition is based on the population size in Turkey. With the 6360 enforced in 2013, there is no village or town in the province. Each place is considered as a neighbourhood. This raises some problems for the policy makers as well as municipalities. Many areas showing characteristics of rurality could be classified as urban while some areas could not. If only the population size at the neighbourhood level of Ankara province is considered, a significant number of neighbourhoods would be called rural areas although they have urban characteristics, and some neighbourhoods displaying rural characteristics would be called intermediate or urban areas according to the new definition.

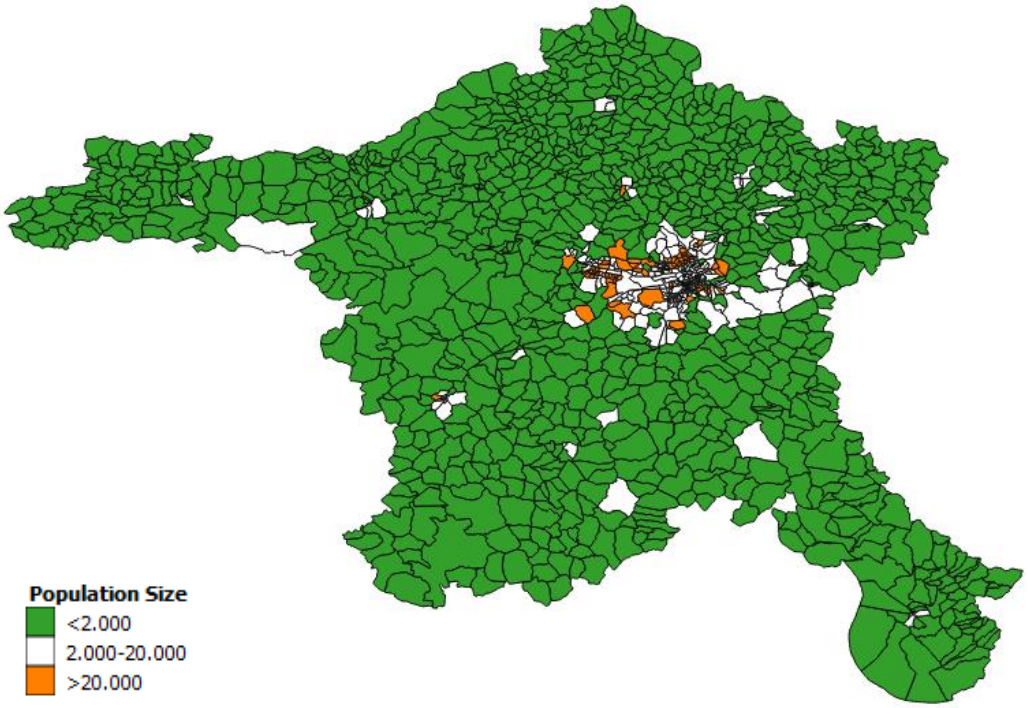

Figure 3: Population Size
Source: own calculations based on TURKSTAT Database (2017)

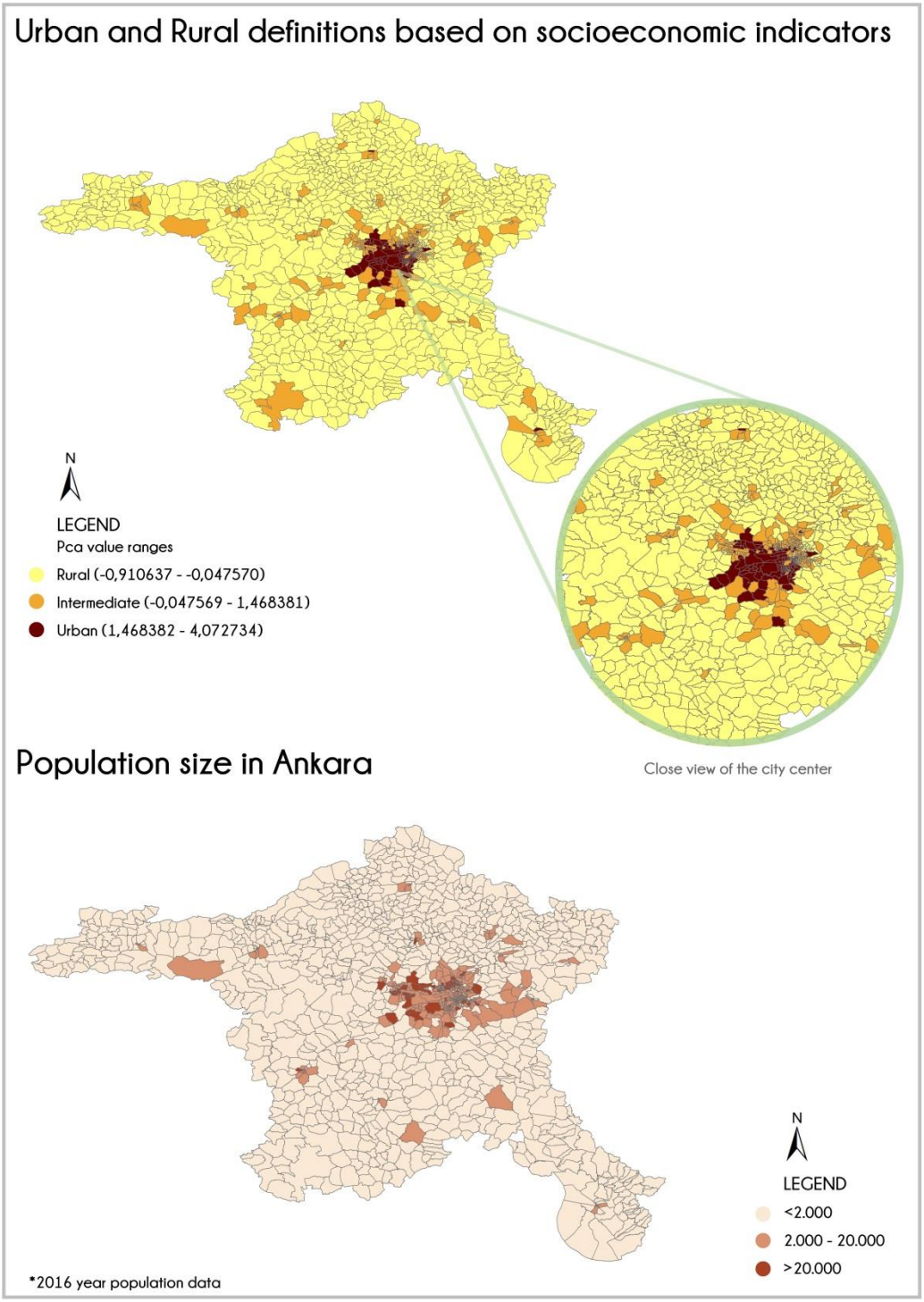

Figure 4: A Close View of the City Centre of Ankara

CONCLUSION

The analysis presents a new model for rural Turkey that is not based on the conservative definitions of population size. Some variables under economic activities, socio-economic structural characteristics, spatial dimensions of social organizations and natural characteristics are included in the model. The rural areas were clearly reflected in the model in a different perspective. In this study, the proportion of the population with university degrees and the number of points of interest were identified by the model as having positively significant impacts on population density, while the number

of summer cottages, total asphalt roads, distance to the nearest administration centre and the number of agricultural holdings were found to negatively impact population density because the administrative structure is totally different in Turkey. The number of neighbourhoods in Ankara is 1,439. Only 5% of the neighbourhoods have a population of more than 20,000. That is why the distance is not differentiated in between rural and urban areas in our study. Another point that needs to be underlined is the total number of asphalt roads. It is usually assumed that rural areas have difficulty of access to total asphalt roads. In Ankara, the estimations show that there is no significant impact of total asphalt roads in a neighbourhood on population density. The most distinguishing feature of rural areas is the lack of education. This study confirms that education is the most important variable for distinguishing rurality. Although it was not possible to include average income at the level of the neighbourhood, the adopted methods are sufficiently accurate for highlighting the rural part of Ankara. It is also possible that the variables used in this model could be baselines for future studies. For a clearer definition, some economic variables, such as income, and some socio-economic variables, such as the number of theatres, cinemas, etc., and natural values of the neighbourhoods could be included. In conclusion, 'rural' is not only defined as a space but it also includes the social representation and economic activities. The rural areas today are unlike yesterday's, and future rural areas will not be the same as today's. The definition needs to be revised as rural areas undergo quick transformations.

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