Article

Borough Development Dependent on Agricultural, Tourism, and Economy Levels

Agnieszka Stacherzak and **Maria Hełdak ***

Department of Spatial Economy, Wroclaw University of Environmental and Life Sciences, 50-375 Wrocław, Poland; agnieszka.stacherzak@upwr.edu.pl
* Correspondence: maria.heldak@upwr.edu.pl

Abstract: The study addresses the problem of functional transformations covering rural and urban-rural municipalities in Lower Silesia voivodship, according to the adopted functional typology of municipalities. The division of municipalities into functional types is a continuation of the research conducted in 1996, 2005, and 2010. The year 2016 was adopted as the base year for comparison, using the same criteria for their classification: the level of industrialization, the structure of the economy, and the level of tourist infrastructure development. The statistical analysis carried out within the framework of the study covered changes in the municipalities' proportions of particular functional types between 1996, 2005, and 2016 and also the impact assessment of the quality of agricultural area and unemployment rate in relation to the determined municipality type. In order to obtain the research results, the statistical analysis using Cochran's Q test was, among others, performed to determine changes in the proportions of municipalities and also one-way analysis of variance between groups was conducted to establish the indicated correlations. In the case of obtaining a statistically significant result, paired comparisons were carried out (between the types of municipalities) using Hommel's procedure. The conducted analysis confirmed the adopted research theses, i.e., in the studied period from 1996 to 2016, the majority of the analyzed regions lost their agricultural function in favor of the industrial function.

Keywords: functional transformations; Lower Silesia; functional types of municipalities

1. Introduction

The recent decades have been very dynamic for Polish rural areas in terms of functional transformations. Apart from the cities experiencing continuous economic and demographic growth, which causes functional changes, there are also some with abandoned urban areas resulting from job losses and economic base decline, environment and infrastructure degradation, and, thus, suffer further corrosion of the related social conditions [1–6].

In addition, the political transformation, which began in Poland in 1989, created new development opportunities. However, in some Polish regions, including Lower Silesia, it contributed to the collapse of the leading industry sectors [7]. The return of some municipalities to the development level from the period preceding the transformation was a long-term process [8]. Some Lower Silesian municipalities are still struggling to have their economic potential restored.

Authors such as Oda K. et al. [9], Hermann et al. [2], Yokohari, and Boltdhouse covered the problem of shrinking cities, which result from depopulation and the related functional transformations [10]. In their opinion, the decline in the number of urban population raises the question of what purpose the land, recovered due to the decreasing population pressure, should serve. Thus, the process of shrinking cities can be perceived as a window of opportunity for administrations

and residents to rethink their vision, strategy, and planning priorities. Hełdak M. et al. discussed the financial consequences of adopting new spatial solutions in local plans [11,12].

The region of Lower Silesia is characterized both by the areas of growth and of depopulation. Unfavorable demographic changes affecting the Sudeten villages were observed throughout the entire post-war period [13–18]. A further depopulation of medium-sized towns in the Sudeten and in the Kłodzko Valley region is anticipated. After World War II, this region became a thriving industrial center where the opened mines or clothing and electromechanical factories attracted thousands of workers to Lower Silesia. The gradual decline of enterprises after 1989 resulted in high unemployment, primarily in Bielawa, Dzierżoniów, and Nowa Ruda [19].

At the beginning of the 20th century, the region of Lower Silesia and, in particular, the areas located near Wałbrzych and Jelenia Góra were characterized by the developing tourist and health functions. Now, the splendor of this region is being restored. In the global dimension, tourism represents one of the most important and fastest-growing economic sectors [20–24]. The aspect of functional transformations in rural municipalities and small towns was also analyzed by taking into account tourist development of a city.

Many of the processes of land evolution and transformation are almost imperceptible when viewed over shorter periods, but, in the long term, they may well lead to changes in the carrying capacity, water balance, and usability of the landscape [25]. The analysis of the rural land modification, as well as its environment and landscape, is important in order to understand the profound transformations connected with the human intervention and natural events [26]. An analysis of land-use and land cover changes is fundamental for understanding numerous social, economic, and environmental problems [27]. Some authors proposed the correlation between agriculture, ecosystems, and the environment [28,29] as the new contribution to territorial planning and management. The size of employment in industry reflects, among others, the state of economic development. According to Przybyła et al. [30,31], significant spatial differences, manifested both by the fundamentally different unemployment rate observed in various areas and also the diversified structure of employment in particular, economy sectors are the characteristics of the Polish market as production factors.

It was decided in the study that the traditional approach for the classification of rural areas, based on the functional criterion, which recognizes the population job structure or the workplace nature (plant or animal production) as the basis for distinguishing villages and cities, has lost its usefulness. The development of non-agricultural functions is an important factor of changes, which remains both permanent and irreversible [32]. According to Maik [33], this process results in blurring the category of settlement units: a city—the concentration of population and non-agricultural activity—and a village—a settlement characterized by functions related to agriculture. Currently, many types of residential areas have been developed, which differ in the occurrence and intensity of features once considered to be specifically urban and rural. The individual types can be considered the consecutive stages of functional transformations in rural areas, which creates a characteristic evolutionary path, according to the scheme of agricultural village–multifunctional village—non-agricultural residential area [33].

The research purpose is to determine functional transformations of rural areas in Lower Silesia voivode-ship and to identify trends of the occurring changes. The discussed problem is closely related to the criteria of functional division, including the classification of Lower Silesian rural and urban-rural municipalities into one of eight functional types, which are described in detail in chapter 2 below Table 1. The functions of municipalities (Types) were determined based on: the level of industrialization, the structure of the economy, and the level of tourist infrastructure development, in accordance with the described methodology.

2. Research Methodology

The research covered the area of 126 rural and urban-rural municipalities located in Poland, in the region of Lower Silesia (Figure 1). According to the Regulation issued by the Council of Ministers,

§2 points 6 to 8, [34], a rural municipality is the municipality in the area of which there are only villages while an urban-rural municipality is the municipality within the area of which one of the locations has the status of a city. Apart from the municipalities adopted for the analysis, in Poland, we also distinguish an urban municipality—a municipality with a city status.

Figure 1. Location of the analyzed area.

Within the area covered by the analysis, there are municipalities, which before the administrative reform of Poland, were located in the following former voivode-ships: Jelenia Góra, Legnica, Wałbrzych, and Wrocław and which currently form the sub-regions of Lower Silesia voivode-ship. The municipalities included in Lower Silesia voivode-ship in 1998, after the national administrative reform at a regional level, were excluded from the analysis due to the difficulties with accessing historical statistical data. The research on functional transformations of Lower Silesia was conducted based on the data (including the historic ones) and information retrieved from the Local Data Bank of the Central Statistical Office [35].

Table 1. The criteria for identifying homogenous types of municipalities in terms of functionality.

No.	Functional Type	Delimitation Criteria		
		Share of Employment in Industry in Total Employment	Share of Agricultural Tax in Total Taxes on Business Activity	Number of Overnight (Tourist) Accommodation Per 1 km^2
		Over 25 %	Over 25%	Over 1 bed/km^2
1	Type I	+	+	+
2	Type II	+	+	-
3	Type III	+	-	+
4	Type IV	+	-	-
5	Type V	-	+	+
6	Type VI	-	+	-
7	Type VII	-	-	+
8	Type VIII	-	-	-

Source: authors' compilation based on References [36].

The analyzed potential of rural areas located in Lower Silesia voivode-ship, in terms of qualifying the municipalities to particular functional types in 2016, was referred to the research carried out in 1996, 2005, and 2010 [7,36–39]. The total timeframe of the conducted analysis is 20 years.

The applied research method follows the steps listed below (Figure 2).

The following research theses were put forward in the article:

Hypothesis 1. *In the studied period from 1996 to 2016, the majority of analyzed regions lost their agricultural function in favor of an industrial one.*

Hypothesis 2. *Industrial regions, after the period of production slump in the 1990s of the 20th century, regained their economic potential in 2016 by reducing the unemployment rate in municipalities.*
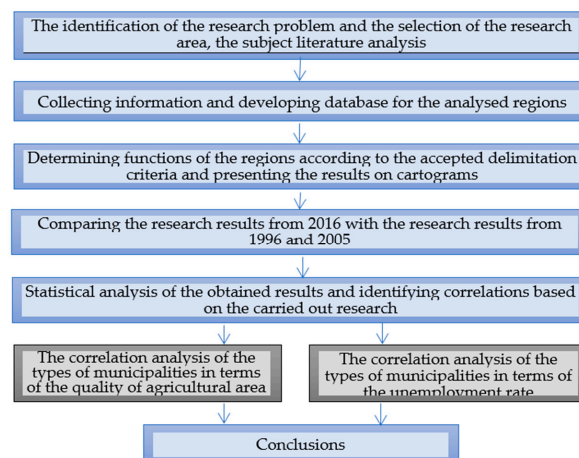

Figure 2. Research stages.

The following delimitation criteria were adopted to identify the functionally homogeneous municipalities [7,36–39].

1. municipalities with dominant agriculture (agricultural tax makes up over 25% of total taxes on business activity);
2. industrialized municipalities (employment in industry accounts for over 25% of total employment);
3. municipalities with developed tourist infrastructure (the number of tourist overnight accommodation amounts to more than 1 bed/1km^2). When distinguishing the particular types of municipalities, the assumption that the number of beds is over 1 bed/km^2 was an important factor. Then one can talk about the tourist function development.

Analyzing land use changes generally requires an integrated approach that considers multiple disciplines, data sources, and methodological constructs [40]. The adopted criteria allowed the identification of eight types of municipalities, which are briefly characterized below. The adopted criteria were compiled in a tabular form (Table 1) and on their basis eight functional types of rural municipalities were identified. The symbol "+" stands for meeting the boundary criterion, i.e., "over 25%" or "over 1 bed/km^2" while the combination of the particular assumed conditions creates a given type.

The descriptive characteristics of the identified types of regions is presented below.

Type I: industrialized municipalities, dominated by agriculture, with developed tourist infrastructure;

Type II: industrialized municipalities, dominated by agriculture, without developed tourist infrastructure;

Type III: industrialized municipalities, with developed tourist infrastructure, almost without agriculture;

Type IV: industrialized municipalities, where agriculture is not of significant importance;

Type V: municipalities dominated by agriculture, almost without industry, with developed tourist infrastructure;

Type VI: municipalities dominated by agriculture, without developed tourist infrastructure, almost without industry;

Type VII: municipalities with developed tourist infrastructure, almost without industry, where agriculture is not of significant importance;

Type VIII: municipalities almost without industry and agriculture, without developed tourist infrastructure.

Using the above criteria, the functional types of municipalities in Lower Silesia voivode-ship were determined for the year 2016 and compared against the functions performed by these research areas in: 1996, 2005, and 2010.

The further research part analyzed the influence of selected natural indicators and the the labor market situation for the obtained research results. Lastly, the quality of agricultural suitability of soil and the unemployment rate for each region (municipality) were determined and statistically analyzed.

The level of statistical significance α = 0.05 was adopted in the analysis using statistical tests. The sample of N = 126 municipalities was analyzed. Cochran's Q tests were performed in order to find out whether the proportions of municipalities regarding the particular functional types were subject to changes between 1996, 2005, and 2016. If a statistically significant result was obtained, in the second step of the analysis, pairwise comparisons were carried out between the specific years using McNemar's test. Further statistical analysis consisted of the impact assessment of the agricultural area quality and the unemployment rate on the municipality type. The research required pairing some types of municipalities due to the low representativeness of the part of Types (functions). In order to obtain the results, e.g. the statistical analysis using Cochran's Q test was conducted to determine changes in the proportions of municipalities and also one-way analysis of variance between groups. If a statistically significant result was obtained, pairwise comparisons were carried out (between the types of municipalities) using Hommel's procedure. The research results are presented in tables (without an extensive database) and on figures.

3. The Functions of Municipalities (Regions) in Lower Silesia

As a result of the conducted research, the municipalities characterized by different functions were identified using the delimitation criteria indicated in the research methodology.

The identified actual functions of municipalities, in 2016, by sub-regions, are presented below (Table 2).

Table 2. The division into individual types of Lower Silesia municipalities in 2016 in accordance with the adopted delimitation criteria.

Subregion	Number of Muni-Cipalities	The Functions of Municipalities														
		I		II		III		IV		V		VI		VII		VIII	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Jeleniogórski	28	0	0	1	3.7	8	28.5	13	46.4	0	0	0	0	3	10.7	3	10.7
Legnicki	31	1	3.2	3	9.7	2	6.5	14	45.2	0	0	7	22.5	1	3.2	3	9.7
Wałbrzyski	30	1	3.3	5	16.7	10	33.3	8	26.7	0	0	0	0	5	1.7	1	3.3
Wrocławski	37	0	0	10	27.0	4	10.8	22	59.5	0	0	0	0	1	2.7	0	0
Total	126	2	1.6	19	15.1	24	19.0	57	45.2	0	0	7	5.6	10	7.9	7	5.6

Note: *N*—quantity. Source: authors' compilation.

The comparison of individual types of municipalities, presented in the table, indicates that, in 2016, the highest percentage of municipalities was classified as Type IV—industrialized municipalities, where agriculture is not of significant importance, since as many as 45.2% of 126 municipalities (57 rural and urban-rural municipalities). In these municipalities, employment in industry amounts to more than 25%. The next group covered Type III municipalities—industrialized municipalities, with developed tourist infrastructure, almost without agriculture (19.0% of all analyzed regions—24 municipalities). Apart from employment at the level of 25%, these municipalities are also characterized by tourist accommodation facilities.

Taking into account the location in sub-regions, in almost all of them, Type IV is the dominant one—industrialized municipalities, where agriculture is not of significant importance. Their highest share was recorded in the Wrocław sub-region (22 out of 37 municipalities). In the Wałbrzych

sub-region, Type III municipalities represent the dominant type—industrialized municipalities, with developed tourist infrastructure, almost without agriculture.

Type V is not present in the region—municipalities dominated by agriculture, almost without industry, with developed tourist infrastructure, whereas Type VI (municipalities dominated by agriculture, without developed tourist infrastructure, almost without industry) is represented in the Wałbrzych region only.

The comparison of identified regional (municipal) functions in the preceding years and in 2016 is presented in the table below (Table 3).

Table 3. The division into individual types of Lower Silesia municipalities, in the years 1996, 2005, 2010, and 2016, in accordance with the adopted delimitation criteria.

Year	Number of Munici-Palities	The Functions of Municipalities														
		I		II		III		IV		V		VI		VII		VIII	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1996	126	1	0.8	2	1.6	16	12.7	21	16.7	7	5.5	48	38.1	9	7.1	21	16.7
2005	126	7	5.5	45	35.7	21	16.7	27	21.4	2	1.6	14	11.1	5	4.0	5	4.0
2010	126	1	0.8	18	14.3	25	19.8	58	46.1	0	-	8	6.3	6	4.8	10	7.9
2016	126	2	1.6	19	15.1	24	19.0	57	45.2	0	-	7	5.6	10	7.9	7	5.6

Note: *N*—quantity. Source: authors' compilation.

The comparison of individual types of municipalities presented in the table indicates that, in 1996, the highest percentage of municipalities was classified as type VI—municipalities dominated by agriculture, without developed tourist infrastructure, almost without industry—as many as 38.1% out of 126 municipalities (48 rural and urban-rural municipalities). The next group covered both type IV municipalities—industrialized municipalities, where agriculture is not of significant importance, and also type VIII municipalities—municipalities almost without industry and agriculture, without a developed tourist infrastructure (16.7% of all analyzed regions each—21 municipalities).

In 2005, the Lower Silesia region was dominated by Type II municipalities (industrialized municipalities, dominated by agriculture, without developed tourist infrastructure). Such municipalities are located in the central and northern part of the voivode-ship (the total of 47 municipalities). In these municipalities, employment in the industry sector accounts for more than 25% of total employment and agricultural tax makes up for more than 25% of all taxes on business activity.

After five years, in 2010, type IV municipalities took the highest share—industrialized municipalities, where agriculture is not of significant importance (58 out of the 126 analyzed municipalities). The second group included type III municipalities—industrialized municipalities, with developed tourist infrastructure, almost without agriculture.

While comparing the research results over the period of 20 years (1996–2016), it can be concluded that the importance of agriculture declined considerably in the analyzed regions. The types of municipalities in which agricultural tax in all taxes on business activity constitutes more than 25% of all taxes (Type I, II, V, and VI), which represent a significant minority. However, some stabilization of the function since 2010 against 2016 is observed. The spatial distribution of research results is illustrated on the respective figures (Figures 3–5).

The spatial distribution of particular types of municipalities in 1996 indicates that rural municipalities (Type VI), which typically dominate the region, were located in the middle part of the region in line from the east to the west, in the area of Nizina Śląska (Silesian Lowland) and Nizina Śląsko-Łużycka (Silesian-Lusatian Lowland). Industrial municipalities (Type IV) were located in a mosaic pattern in the whole area of Dolnośląskie voivode-ship with a clear domination of the Legnicki sub-region [37,38]. Type III—industrial municipalities with tourism organization, almost without agriculture—are quite strongly represented in the southern part of the Sudety Mountains.
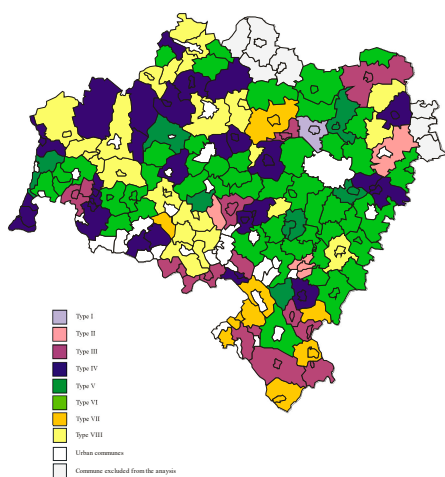
Figure 3. Spatial arrangement of the functions of rural and urban-rural municipalities in Lower Silesia, according to the typology adopted in 1996.
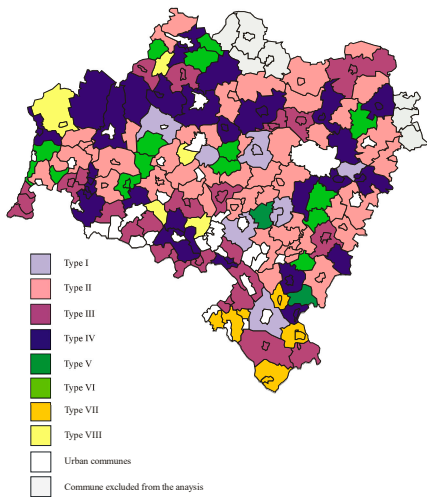

Figure 4. Spatial arrangement of the functions of rural and urban-rural municipalities in Lower Silesia, according to the typology adopted in 2005.
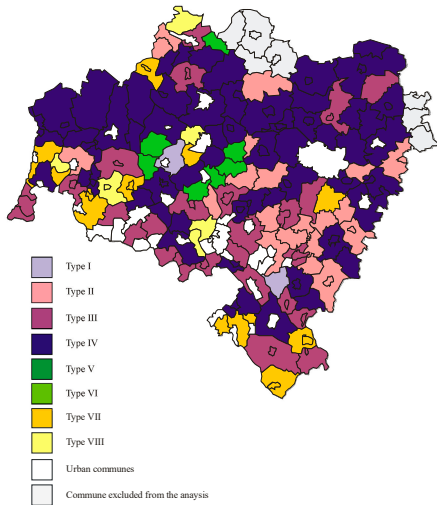

Figure 5. Spatial arrangement of the functions of rural and urban-rural municipalities in Lower Silesia, according to the typology adopted in 2016.

The research showed that, in 2005, Type II municipalities dominated in Dolnośląskie voivode-ship (industrial communes dominated by agriculture, without tourism) [37]. Type III municipalities—industrial municipalities with tourism organization, almost without agriculture, constitute spatial complementation of industrial municipalities, where agriculture does not play an important role (Type IV). Such collation showed that municipalities of diverse levels of industrial development significantly dominated the region in 2005. Type VII—municipalities of tourist organization, are located in Kotlina Kłodzka.

Spatial distribution of the regions indicates strong dominance of Type IV municipalities in 2016, in the northern part of Lower Silesia. These are industrialized municipalities, where agriculture is not of significant importance, even though these areas are characterized by favorable conditions for agricultural production since they feature a high quality of agricultural area. In 1996, these particular municipalities were classified as the regions lacking any dominant function (Type VIII) or as the typically agricultural regions (Type VI). As compared to the situation in 2005, the transformations for reaching the level of 25% employment in industry, along with the simultaneous decline of agricultural functions, are visible.

In 2016, the southern highland areas of the region were characterized by Type III municipalities, which are industrialized municipalities with developed tourist infrastructure and almost without agriculture. A similar characteristic of the discussed areas was recorded in 2005. In 1996, the municipalities lost their original industrial characteristic, and then focused on the development of tourism due to their natural and landscape values.

The south-eastern part of the region was dominated by Type II municipalities, which are industrialized municipalities, dominated by agriculture, without a developed tourist infrastructure. These municipalities were definitely agriculturally-oriented in 1996. Currently, they are classified as industrial and agricultural ones. At the same time, these areas feature one of the highest scores in terms of agricultural quality of soils in Lower Silesia.

In order to determine whether the proportions of municipalities in terms of their functional types were subject to changes between 1996, 2005, and 2016, the statistical analysis using Cochran's Q test was performed. If a statistically significant result was obtained, in the second step of the analysis, pairwise comparisons were carried out between the particular years using McNemar's test. The research results are presented in Table 4.

Table 4. The proportions of functional types of municipalities in the years 1996, 2005, and 2016.

Type of Municipalities	Year							
	1996		**2005**		**2016**			
	n	[%]	*n*	[%]	*n*	[%]	Q(2)	*p*
I	1_a	0.8	7_b	5.6	2_{ab}	1.6	6.20	0.045
II	4_a	3.2	45_b	35.7	19_c	15.1	50.63	<0.001
III	14_a	11.1	18_{ac}	14.3	24_c	19.0	5.63	0.060
IV	24_{ab}	19.0	29_{ab}	23.0	57_c	45.2	28.33	<0.001
V	7_{ab}	5.6	5_{ab}	4.0	0_c	0.0	7.80	0.020
VI	46_a	36.5	11_{bc}	8.7	7_{bc}	5.6	64.23	<0.001
VII	8	6.3	5	4.0	11	8.7	3.86	0.145
VIII	22_a	17.5	6_{bc}	4.8	6_{bc}	4.8	18.96	<0.001

Note. The cells marked with identical letters indicate the absence of a statistically significant difference between the paired years.

The conducted analyses indicate that, in the case of functional types of municipalities I, II, IV, V, VI, and VIII, the statistically significant differences in the proportions between the analyzed years were

recorded. Figure 6 presents a graphical interpretation of the sample structure in terms of the functional types of municipalities in the analyzed periods.
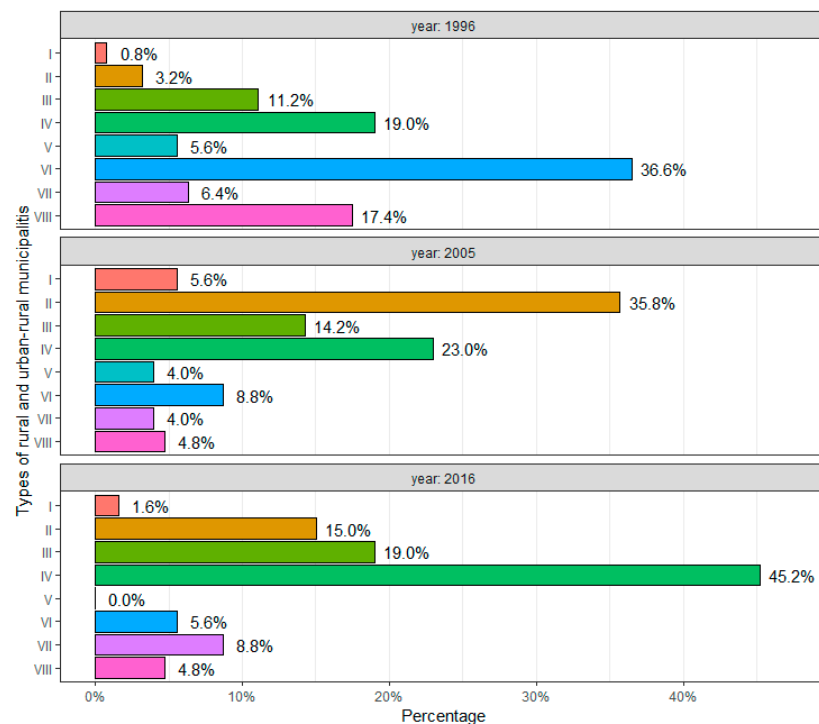

Figure 6. The proportions of functional types of municipalities in the years 1996, 2005, and 2016.

The findings of the analyses carried out in the study, in terms of paired comparisons, are as follows.

- the percentage of Type I municipalities (industrialized municipalities, dominated by agriculture, with developed tourist infrastructure) was higher in 2005 than in 1996 and 2016;
- the lowest percentage of Type II municipalities (industrialized municipalities, dominated by agriculture, without developed tourist infrastructure) was recorded in 1996. In 2005 an increase in the percentage of this type of municipalities was observed, whereas, in 2016, a decline to the level higher than the one in 1996;
- the percentage of Type IV municipalities (industrialized municipalities, where agriculture is not of significant importance) was higher in 2016 than in the years 1996 and 2005;
- the percentage of Type V municipalities (municipalities dominated by agriculture, almost without industry, with developed tourist infrastructure) was higher in the years 1996 and 2005 than in 2016, when no municipalities of this type were recorded;
- the percentage of Type VI municipalities (municipalities dominated by agriculture, without developed tourist infrastructure, almost without industry) was higher in 1996 than in 2005 and 2016;
- the percentage of Type VIII municipalities (municipalities almost without industry and agriculture, without developed tourist infrastructure) was higher in 1996 than in 2005 and 2016.

The research did not reveal the growing importance of tourism in the region despite the generally noticeably higher level of tourist services. In the global dimension, tourism represents one of the most important and fastest-growing economic sectors [20–22]. A slight increase in the number of beds in the analyzed municipalities was recorded in 2016 against 1996 and 2010. Therefore, further development of the tourist function in the region's sub-mountain municipalities can be expected. According to Rogerson [41], the promotion of urban tourism is associated with economic revitalization and the economic development of cities.

4. The Correlation Analysis of the Types of Municipalities in Terms of the Quality of Agricultural Area and Unemployment Rate in 1996, 2005, and 2016

The correlation analysis of the types of municipalities in terms of the quality of agricultural area and unemployment rate required pairing some of the identified municipalities in accordance with the following principle: Type I and II, Type III, Type IV, Type V and VI, and also Type VII and VIII. The first step of the analysis consisted of calculating the descriptive statistics and examining the compatibility of dependent variables' distribution against the normal distribution. The results of the analysis are presented in Table 5.

Table 5. The quality of agricultural area and unemployment rate in the years 1996, 2005, and 2016—descriptive statistics and verification of the distribution normality.

Specification	Min.	Max.	*M*	*SD*	V	S_k	K	W	*p*
The quality of agricultural area	38.60	108.70	74.65	15.70	21.03	0.08	−0.80	0.98	0.107
Unemployment rate 1996	4.20	28.70	14.68	4.45	30.31	0.37	0.12	0.99	0.450
Unemployment rate 2005	10.20	44.10	26.76	6.69	25.01	0.16	−0.45	0.99	0.533
Unemployment rate 2016	2.20	25.20	11.19	5.11	45.71	0.50	−0.08	0.97	0.014

Note. N = 126. min. = minimum. max. = maximum. M = mean. SD = standard deviation. V = coefficient of variation. S_k = skewness. K = Kurt. W = statistics using Shapiro-Wilk test. p = empirical level of statistical significance.

It was found that, only in 2016, in terms of the unemployment rate, the distribution deviation from the normal distribution was statistically significantly. In order to examine whether the municipalities of individual types differed in terms of the quality of the agricultural area, the one-way analysis of variance between groups was carried out. The analysis was conducted three times—for each period separately. If a statistically significant result was obtained, paired comparisons were performed (between the types of municipalities) using Hommel's procedure. The results of the analysis are presented in Table 6.

The results of the analysis of variance indicate that, in all three analyzed periods of time, the statistically significant differences between the types of municipalities, in terms of the quality of agricultural area, were recorded. In 1996, Type V/VI municipalities were characterized by a higher quality of agricultural area against the other types of municipalities (except for I/II) (A very wide confidence interval (shown in Figure 3) regarding the mean value in type I/II municipalities is worth emphasizing. This was due to the fact that, in 1996, there were only five observations in the group of I/II municipalities, which had only five observations.). In the situation of industry decline a return to the agricultural function of the municipality that took place—Type V and VI municipalities are dominated by agriculture. The function of the regions focused on agricultural production by taking advantage of high soil quality for this purpose. In turn, in 2005 and 2016, type I/II and V/VI municipalities were characterized by a higher quality of agricultural area against the municipalities of other types (Types I and II represent industrialized municipalities, dominated by agriculture, Types V and VI—municipalities dominated by agriculture, almost without industry). Figure 7 presents the graphical interpretation of the analysis of variance.

The analogical procedure was used to examine whether the municipalities of particular types differed in terms of the unemployment level in 1996, 2005, and 2016. The analysis results are presented in Table 7 and in Figure 8.

Table 6. The comparison of the agricultural area between the types of municipalities in the years 1996, 2005, and 2016.

Type of Municipalities	Statistical Measure	Year		
		1996	**2005**	**2016**
I/II	n	5	52	21
	M	72.82$_{abce}$	80.95$_{ad}$	89.45$_{ad}$
	SD	14.87	12.95	11.34
III	n	14	18	24
	M	64.73$_{abce}$	66.43$_{bce}$	68.38$_{bce}$
	SD	13.76	14.99	16.14
IV	n	24	29	57
	M	70.35$_{abce}$	69.38$_{bce}$	72.97$_{bce}$
	SD	13.27	14.85	12.57
V/VI	n	53	16	7
	M	84.02$_{d}$	82.60$_{ad}$	88.13$_{ad}$
	SD	13.38	12.43	6.89
VII/VIII	n	30	11	17
	M	66.47$_{abce}$	60.62$_{bce}$	65.30$_{bce}$
	SD	13.89	16.34	17.04
	$F(4; 121)$	11.53	9.34	11.46
	p	<0.001	<0.001	<0.001
	η^2	0.28	0.24	0.28

Note. n = number of observations in the group. M = mean. SD = standard deviation. F = statistics in the analysis of variance between and within group degrees of freedom. p = empirical level of statistical significance. η^2 = eta^2 effect size measure corresponding to the proportion of the explained variance.
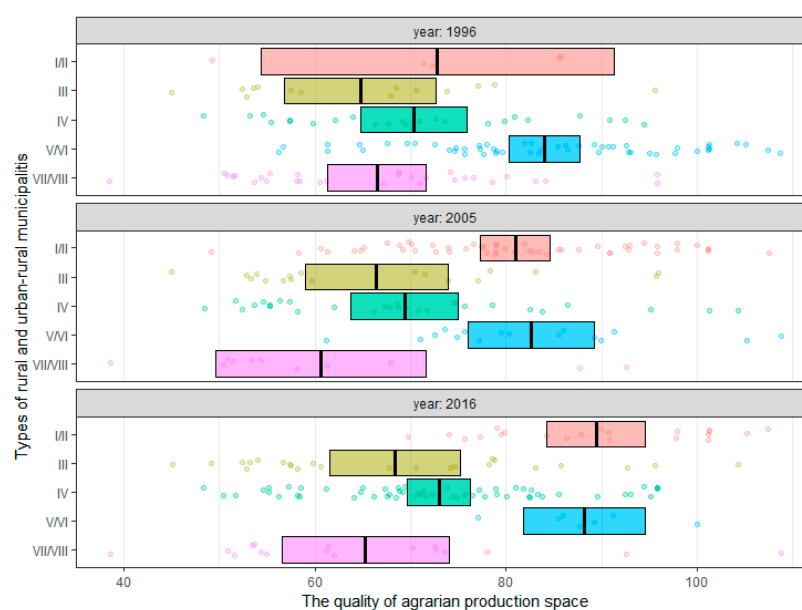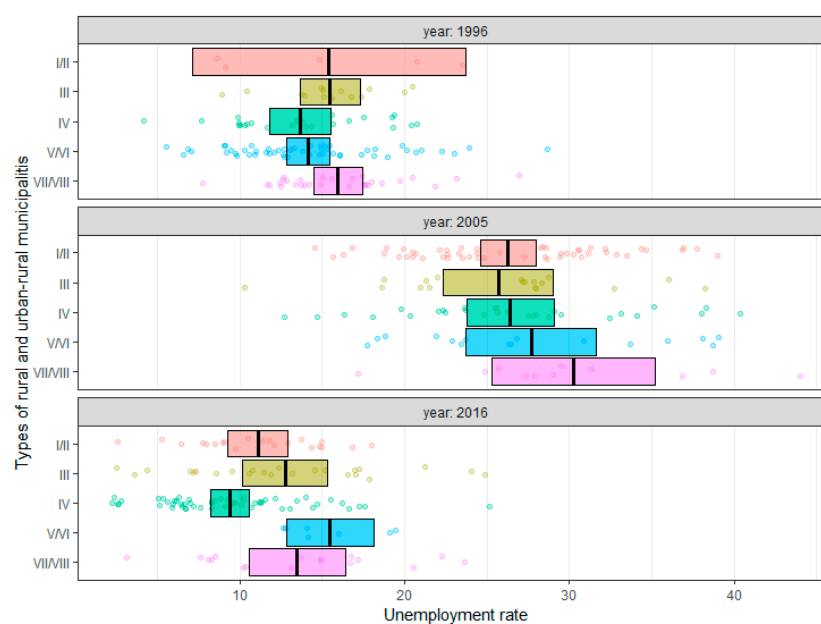

Figure 7. The quality of agricultural area depending on the municipality type and the analyzed period. Each point stands for one municipality. Bold vertical lines present group mean values. Rectangles show confidence intervals (PU 95%) for the group mean value.

Table 7. The comparison of the unemployment rate between the types of municipalities in 1996, 2005, and 2016.

Type of Municipalities	Statistical Measure	Year		
		1996	**2005**	**2016**
I/II	*n*	5	52	21
	M	15.38	26.28	11.09$_{abcde}$
	SD	6.68	6.12	3.97
III	*n*	14	18	24
	M	15.47	25.69	12.75$_{abde}$
	SD	3.19	6.71	6.08
IV	*n*	24	29	57
	M	13.65	26.42	9.36$_{ac}$
	SD	4.38	6.97	4.39
V/VI	*n*	53	16	7
	M	14.16	27.69	15.47$_{abde}$
	SD	4.74	7.43	2.84
VII/VIII	*n*	30	11	17
	M	15.95	30.24	13.48$_{abde}$
	SD	3.96	7.38	5.65
	$F_{(4; 121)}$	1.27	1.02	5.03
	p	0.290	0.400	< 0.001
	η^2	0.04	0.03	0.14

Note. *n* = number of observations in the group. *M* = mean. *SD* = standard deviation. *F* = statistics in the analysis of variance between and within group degrees of freedom. *p* = empirical level of statistical significance. η^2 = eta^2 effect size measure corresponding to the proportion of the explained variance.

Figure 8. The unemployment rate depending on the municipality type and the analyzed period. Each point stands for one municipality. Bold vertical lines present group mean values. Rectangles show confidence intervals (PU 95%) for the group mean value.

The analysis findings confirm that, only in the case of 2016, the statistically significant differences between the types of municipalities, in terms of the average unemployment rate, were recorded. (Due to the fact that the earlier analysis showed that the unemployment rate distribution in 2016 was statistically significantly apart from the normal distribution, a non-parametric equivalent of the one-way analysis of variance was additionally carried out in this case—i.e., the Krukuskal-Wallis test. The test result [H = 19,21, p < 0,001] also required the null hypothesis to be rejected about the absence of differences between the types of municipalities in terms of the unemployment rate.) Paired comparisons using Hommel's procedure showed that the average unemployment rate in Type IV municipalities (industrialized municipalities, where agriculture is not of significant importance) was lower than in Type III municipalities (industrialized municipalities, with developed tourist infrastructure, almost without agriculture) and also lower than in Type V/VI (municipalities dominated by agriculture, almost without industry) and in Type VII/VIII (municipalities almost without industry and agriculture).

5. Conclusions

The conducted research allowed for confirming the put forward theses and formulating the following conclusions.

The number of municipalities in Lower Silesia voivode-ship, where agricultural tax constituted 25% of total taxes on business activity regarding the municipalities included in Types I, II, V, and VI, changed from 58 to 126 of the municipalities analyzed in 1996, to 68 municipalities in 2005 and 28 municipalities in 2016. In recent years, the tendency has been to give up agricultural activity and take measures to develop, strengthen, or revive the new functions. At the same time, the share of municipalities in which employment in industry accounted for 25% of total employment increased from 40 in 1996 up to 100 in 2005 and 102 municipalities in 2016.

The conducted research confirmed Hypothesis 1 stating that, in the period under analysis, i.e., 1996–2016, the majority of analyzed regions lost their agricultural function in favor of an industrial one. It confirms the results of the research carried out so far. In the south of the region, a progressive and continuously advancing process of agricultural function, as the leading function, disappearance has been observed [42].

No significant development of the tourist function was recorded in the region. Likely, it is going to be the next stage of functional changes in the Lower Silesia region. The municipalities have already followed their transition from the agricultural function towards the industrial one. However, they still do not take full advantage of their tourism potential. According to the predominant approach presented in the subject literature, settlement units, which concentrate several or all types of functions in their area, have greater chances for survival and rapid development [43,44]. In this context, it should be observed that the diversification of a city's economic base, including tourism-related activities, facilitates the construction of an area's development potential [24].

Functional changes occurring in rural and urban-rural municipalities of Lower Silesia result in the improvement of their economic conditions. Some of the municipalities located in highland areas had no alternative to focus their development on agriculture due to the low quality of agricultural suitability of soil. Hence, in 1996 and 2005, they were classified as type VIII municipalities—lacking any dominant function (in the face of industry decline in these municipalities the dominant function did not exist). Currently, they perform different functions than the agricultural ones.

The municipalities located in the vicinity of large cities in the region (Bolesławiec, Lubin, Głogów) were also classified as Type VIII in 1996 (lacking any dominant function), despite better agricultural suitability of soil. It probably resulted from the reduction or closing jobs in the nearby towns, along with the absence of developed agricultural functions in these municipalities. In 2005, these municipalities were already included in type IV (industrialized municipalities, where agriculture is not of significant importance).

Having analyzed the above, Hypothesis 2 can also be confirmed. Industrial regions, after the period of production slump in the 1990s of the 20th century, regained their economic potential in 2016 by reducing the unemployment rate in municipalities. Based on the carried out statistical analysis, it was established that the average unemployment rate in Type IV municipalities (industrialized municipalities, where agriculture is not of significant importance) was lower than in Type III municipalities (industrialized municipalities, with developed tourist infrastructure, almost without agriculture), in Type V/VI (municipalities dominated by agriculture, almost without industry), and Type VII/VIII (municipalities almost without industry and agriculture).

The phenomena typical for economic development are taking place in Lower Silesia. The identified types can be considered the consecutive stages of functional transformations covering rural areas, which create the characteristic evolutionary path in accordance with the Maik scheme: agricultural village–multifunctional village—non-agricultural residential area [33].

In the light of the presented research, the authors definitely intend to continue working on the problem of functional changes occurring in municipalities and resulting from the ongoing decline in the number of Lower Silesia region residents, which will also allow them to be present in the scientific discussion on an international forum. The research methods analysing the phenomenon of depopulation in the context of functional changes will be developed. Further research will be focused on the possibility of developing brownfield sites and wasteland areas in cities affected by depopulation for the purposes related to improving the life quality of residents (public green space, sport and recreation areas, urban agricultural land). The process of shrinking cities can be perceived as a window of opportunity for both the administration authorities and the residents to reconsider their vision, strategies, and priorities in spatial planning.

Author Contributions: Conceptualization, A.S. and M.H.; Methodology, A.S. and M.H.; Software, M.H.; Validation, A.S.; Formal analysis, A.S.; Investigation, A.S.; Resources, A.S.; Data curation, A.S.; Writing—original draft preparation, A.S. and M.H.; Writing—review and editing, M.H. and A.S.; Visualization, A.S.; Funding acquisition, M.H.

Conflicts of Interest: The authors declare no conflict of interest.

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