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Rural municipalities in Poland: development types, paths and perspectives[1]

Preliminary results – the spatial aspect

Abstract: *The report presents the results from the analysis of the population of Polish rural municipalities. The analysis was related to broadly conceived "sustained development". An essential aspect was also associated with "comparison" (yielding "development quality"), necessitating establishment of "types" ("development types" or "paths"), within which comparison would be justified. A number of techniques were used in the study, ranging from correlation analysis, through simple linear regression and factor analysis down to cluster analysis. Based on the results from application of these techniques, a series of initial hypotheses, concerning the classification of Polish rural municipalities, could be verified. The analyses, referring to a large extent to the spatial aspect of the population of Polish rural municipalities, enabled also visual verification of the hypotheses mentioned. Likewise, the types established refer to a large extent to the spatial position of the municipalities and the structures thereof. Given the characteristics of the types, their validity for policy making in terms of potential future developments and their consequences, could also be established. This refers in a special manner to the processes, leading to excess congestion and disorderly urbanisation, to spatial segregation, as well as marginalisation and socio-economic collapse. Of particular importance is the capacity of assessing, in addition to the spatial aspect, the current and potential dimensions of these phenomena.*

Keywords: *rural municipalities, types of development, spatial structures, migration, employment, regression models, congestion, spatial segregation, marginalisation*

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Introduction

The paper presents the results from the analysis of the population of Polish rural municipalities, this analysis being a continuation of the work, whose output was presented in Owsiński (2009) – see also Owsiński (2008a,b,c), for a broader perspective on the study, including the methodological one. The analysis reported was carried out in the framework of two different projects, and so its purposes were multiple, although in each case related to "sustained development". An essential aspect has been, as well, associated with "comparison" (yielding "development quality"), which necessitated establishment of "types", within which comparison would be justified. Thus, one would have to deal with "development types", strictly linked with "development paths", and therefore also with "perspectives" (hypothetical futures), especially if definite ergodicity can be assumed. The latter would, roughly, mean that evolutions over time are represented in a single point in time by various units, appropriately (conform to a "theory") distributed in space (e.g. at increasing distances from an urban core). A number of techniques were used in the analysis, ranging from correlation analysis, through simple linear regression and factor analysis down to cluster analysis.

Polish municipalities (NUTS 5 or LAU 2), altogether more than 2500 units, are purely formally classified into three categories: urban municipalities (309), rural municipalities (close to 1600), and urban-rural municipalities (around 600). At the NUTS 4 (LAU 1) level the municipalities, or communes, form counties, of which there are altogether 385. Most of county seats are located in urban communes, only few in urban-rural ones. The urban-rural communes are formed when the urban unit is small enough to warrant joint administration with the surrounding rural unit. The study reported encompassed not only formally rural, but also urban-rural municipalities, in view of significant overlapping of their essential characteristics.

Hence, it must be emphasised that we do not address here the "rural areas" in the sense of the substance-based definitions adopted, e.g. by OECD, or by other bodies (or more refined ones, like those developed for purposes of the FARO EU 6FP project, see www.faro-eu.org), but the formally rural municipalities in the sense of Polish administrative regulations. This is justified by two main reasons: 1. one of the ultimate objectives is to define policies, which would in any case address administrative units rather than any other constructs; 2. all sorts of "objective" definitions of rural, urban etc. areas have to recur to some arbitrary choice (e.g. of the "resolution level"), so that internal consistency and data problems may arise.

The analysis accounted for more than 20 variables, based on the data provided by the Central Statistical Office (GUS) in the form of the Regional Data Bank (BDR), for all the municipalities in Poland, over the period 2003-2007. These data suffer from a number of serious shortcomings, as explained in Owsiński (2009). Still, they are the most reliable source of information on the lowest

level of administrative breakdown. The shortcomings of these statistics are essentially related to what the policies try to aim at, namely local economic activity, employment outside farming and unemployment. In brief, they are related to the following issues:

- employment statistics do not account for employment on family farms;
- farmers running farms beyond 2 ha cannot register as unemployed;
- employment (outside of family farming) is registered and shown per location of the enterprise, and not the residence of the employed persons;
- petty businesses, run on a farm (a small repair shop, a service outlet) do not have to register at all, unless they exceed a certain turnover threshold.

If we add to the above all kinds of phenomena, associated with the shadow or black economy, then the potential error margin becomes truly formidable. Yet, as said, these statistics are routinely gathered on the annual basis, and find indirect matching counterparts within a broad spectrum of data gathered simultaneously (e.g. on demographic processes).

The working hypothesis

For purposes of this paper, we shall report from a vein in the study that attempted to grasp the diversity of municipal situations that could be telling for the potential future evolution(s), and focus on the spatial aspect. Even though we disposed of data for a series of years (2003-2007), we neither thought they are sufficient for any dynamic model, nor could we afford truly sufficient time series, since there was a serious break in the shape of administrative division of the country in 1999. Hence, we decided to identify static models that would display adequate stability over time, at least in qualitative terms. Thereby, we hoped to establish "types" or "development paths", in relation to such models of crucial variables, selected as indicators, or symptomatic quantities.

Thus, after the first, preliminary stage of analysis, a very rough leading working hypothesis was formulated concerning the classification of rural municipalities in Poland, namely those:

1. with high and increasing population densities, located within or at the fringes of large urban agglomerations, usually featuring high levels of economic activity (outside agriculture), as expressed through the numbers of persons employed outside of family farming, number of businesses per 1 000 inhabitants, structure of revenue of the municipal budgets (tax-related revenues) and the budget revenues per capita;
2. with high and increasing population densities, located close to smaller urban centres, or in areas with low urbanisation indices, characterised by a wide variety of variable values, but differing from those characteristic for the vast majority of rural areas, this meaning, in particular, that an important part of actually occuring socio-economic processes in these areas goes officially unnoticed (employment, revenues);

3. endowed with definite positive location rent, first of all associated with tourism and recreation, especially along the seaside, in some of the lake districts, and in some mountain areas; these are mainly distinct through economic variables, similarly as the two previous categories;
4. endowed with a location rent, associated with economic activity – particularly location of an important business or a number of businesses, often dating yet from the socialist period, and frequently, though not exclusively, from the mining and energy sector; at least some of these should be well visible through the number of registered employed outside of family farming per 1 000 inhabitants;
5. truly "rural" and "agricultural", in which farming seems to really play an important economic and social role, as seen through employment and tax revenue data;
6. "rural", but "marginal" rather than "agricultural" in the sense of activity levels and budget revenues; this category might be subdivided into (a) the ones, in which agriculture plays a lesser role due to "objective" factors (forest areas, mountains, etc.), and (b) where there is simply serious depopulation and abandonment of agricultural activities, usually situated far from urban centres.

The study aimed at verification of this rough hypothesis, and its validity in terms of numbers of municipalities in particular categories (if any), as well as identification of potential significant sub-categories, and their more detailed characteristics. In accordance with the "ergodic" meta-hypothesis, an important aspect was constituted by the spatial pattern of distribution of municipalities displaying characteristics allowing for classification in the above categories. Thereby, at least preliminary conclusions might have been drawn as to the future fate of these units. The conclusions would include the development perspectives, as implied by (i) dynamics to date within a given (sub-)category and the neighbouring ones; and (ii) the specific characteristics, especially related to the socio-economic activity levels and the robustness of the local systems, as measured, in particular, through variables pertaining to human capital (e.g. personal income tax per capita, number of employed per business, presence and importance of post-primary education).

Given the limited space of this paper, attention was mostly focused on the spatial aspect of the considerations, of essential importance, as indicated above, for the more general leading meta-hypothesis.

Models of net migration

Internal migrations are treated among the most important processes, both indicative of the more general phenomena, social and economic, and conditioning definite further developments (e.g. depopulation and ageing of remote rural areas, or increasing congestion in some urban areas). We have indicated in Owsiński (2009) that the *polarisation* and *urban sprawl* processes are indeed taking place in Poland, with significant implications for rural areas. Identified

models of net migration to rural communes showed that attraction is determined by the clear "agglomeration syndrome", meaning that migrations are attracted by places, where "activity already is".

Table 1, showing the coefficients for the linear regression models of net migration to rural communes in consecutive four years (2003-2006), illustrates well this phenomenon. The models were calculated for unitarised data (i.e. variable values belonging to the interval [0,1]).

Table 1. Linear models of net migration to rural municipalities in Poland

Year	R^2	Con-stant	Popu-lation	Popu-lation density	Estate tax pc.	Reven-ues from PIT* pc.	Reven-ues from CIT** pc.	Invest-ment outlays pc.#	Emp-loyed outside family farming pc.	Jobless pc.	Number of busi-nesses pc.
2003	0.39	0.1583	0.1229	-0.0145	0.2835	0.2699	0.2771	0.0636	-0.2587	-0.0329	0.2818
2004	0.37	0.1676	0.1292	-0.0784	0.3959	0.3683	-0.0110	-0.0836	-0.0478	-0.0321	0.3418
2005	0.38	0.1870	0.1376	-0.0555	0.7527	0.3565	0.2852	-0.2039	-0.4906	-0.0618	0.2936
2006	0.40	0.3357	0.0974	-0.0506	0.4987	0.3117	0.0088	-0.0295	-0.1522	-0.0779	0.1695

Source: own calculations on the basis of data from the BDR GUS
Explanations: pc. = per capita; * PIT = Personal Income Tax; ** CIT = Corporate Income Tax; # from communal budget

The models, quoted in Table 1, referred to general characteristics of the rural communes (population number, population density, unemployment, employment outside of family farming – with reservations explained before, and entrepreneurship of the population), and to the characteristics, implied by the communal budget (estate tax, budget revenue from personal income tax, budget revenue from corporate tax, and investment-oriented outlays from the budget – all of these per capita). Just because of the use of the latter group of variables, we quote here also the results for a very simple model (one of several tested), meant to explain the structure of communal budgets.

Table 2. Municipal budget per capita in rural communes – simple linear models for consecutive years

Year	R^2	Constant	Farming tax per capita	Estate tax per capita	Revenue from PIT per capita	Revenue from CIT per capita
2003	0.85	0.0182	-0.0022	0.9698	0.0049	0.0125
2004	0.71	0.0228	-0.0040	0.8771	-0.0017	0.0886
2005	0.82	0.0079	0.0000	0.8327	-0.0058	0.0961
2006	0.76	0.0170	-0.0017	0.8386	-0.0056	0.1194

Source: own calculations on the basis of data from the BDR GUS

With respect to the latter table, whose significance is confirmed by the high values of R^2 – while it is not surprising that the farming tax plays a marginal role, since its rates are barely noticeable, the role of the estate tax throughout the entire population of rural communes is an important observation. The re-

venues from CIT are much more significant in urban communes, and so are those from PIT, but there exist a whole class of rural communes, in which revenue from PIT is also quite important (actually, in quite a share of rural communes this revenue is as important as that from the estate tax). The overall nature of dependence of the net migration flows upon the PIT-based revenue in the recipient communes is well illustrated by Figure 1.
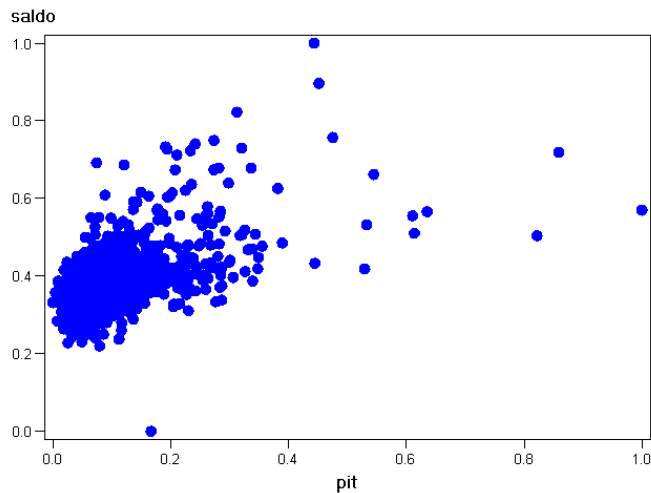

Figure 1. Net migration (vertical axis) vs. PIT-based revenue per capita (horizontal axis) for rural communes in Poland in 2006. The bordering straight lines are added for emphasis
Source: own calculations on the basis of data from the BDR GUS

Against this background the fact that in Table 1, where migration models are shown, the revenue from PIT ranks second in importance, just after the estate tax, and before the number of businesses, comes out as an important observation. (As a footnote: in these models, population number took over the effect that was shown in the previous paper, Owsiński, 2009, for the population density. Actually, if only population density is accounted for out of the two variables, it turns out to have positive and significant, though not very pronounced coefficients in the model).

Table 3. A migration model for rural communes, 2003

R^2	Con-stant	Popu-lation density	Reve-nue from PIT pc.	Reve-nue from CIT pc.	Estate tax pc.	Invest-ment outlays pc.	Busi-nesses pc.	Em-ployed outside family farming pc.	Unem-ployed pc.
0.35	0.144	0.070	0.307	0.312	0.229	0.038	0.290	-0.221	-0.030

Source: own calculations on the basis of data from the BDR GUS

Table 3 largely confirms the previous results, for a different choice of variables. Now, if these models "filter out" a definite class of rural communes, it is interesting to know the respective spatial pattern. It is shown in Figure 2.

| < -3 | -3;-1 | -1; 1 | 1; 3 | > 3 |

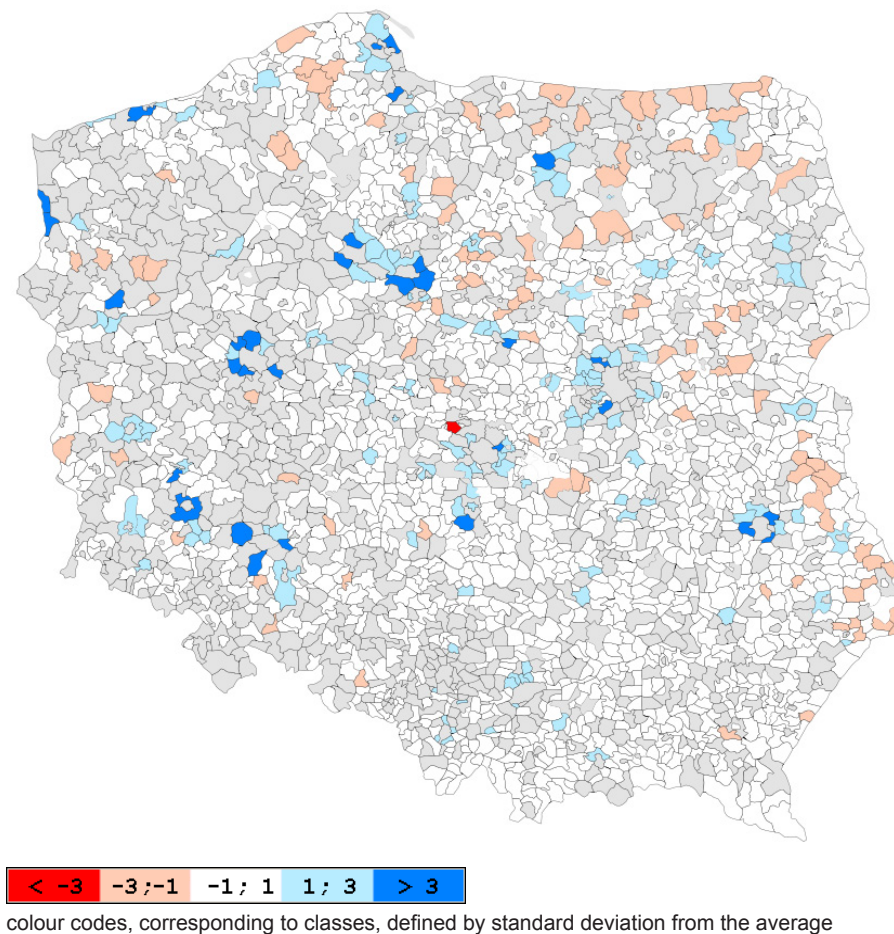colour codes, corresponding to classes, defined by standard deviation from the average

Figure 2. Rural communes in Poland according to categories of net migration values in 2006. Grey colour denotes communes that are not rural (urban and urban-rural)
Source: own calculations on the basis of data from the BDR GUS

It can be very easily be seen from Figure 2 that the communes with net migration values bigger by at least one standard deviation than the average (dark blue and blue) cluster, first of all, around and near large urban centres (i.e. actually enter their metropolitan areas or broadly conceived agglomerations). This applies in a particular manner to Warsaw, Poznań, Wrocław, the twin agglomeration of Bydgoszcz and Toruń, Lublin, Olsztyn, the Tri-City of Gdańsk, Gdynia and Sopot, Lodz, as well as smaller centres, like Gorzów and Zielona Góra. The image is perturbed by the low number of rural communes in the vicinity of Cracow and in the Upper Silesian conurbation. Most of

the remaining communes with high net migration are associated with other centres, of regional or purely local character.

The situation is not as simple with the communes, featuring high outmigration (pink and [one] red in Figure 2). The most pronounced spatial characteristic is their location in north-eastern part of Poland (although here, again, the image is distorted by the fact that vast areas in the West of Poland are dominated by urban-rural communes). In any case, they represent, with just few exceptions, the definitely rural and peripheral areas (including those adjacent to the Polish-Russian border).

As we are primarily interested in the processes or modes of behaviour, which can be the basis for conclusions, concerning future developments and their paths in general, we propose to look at a similar map (Figure 3) of the errors of model from Table 1.
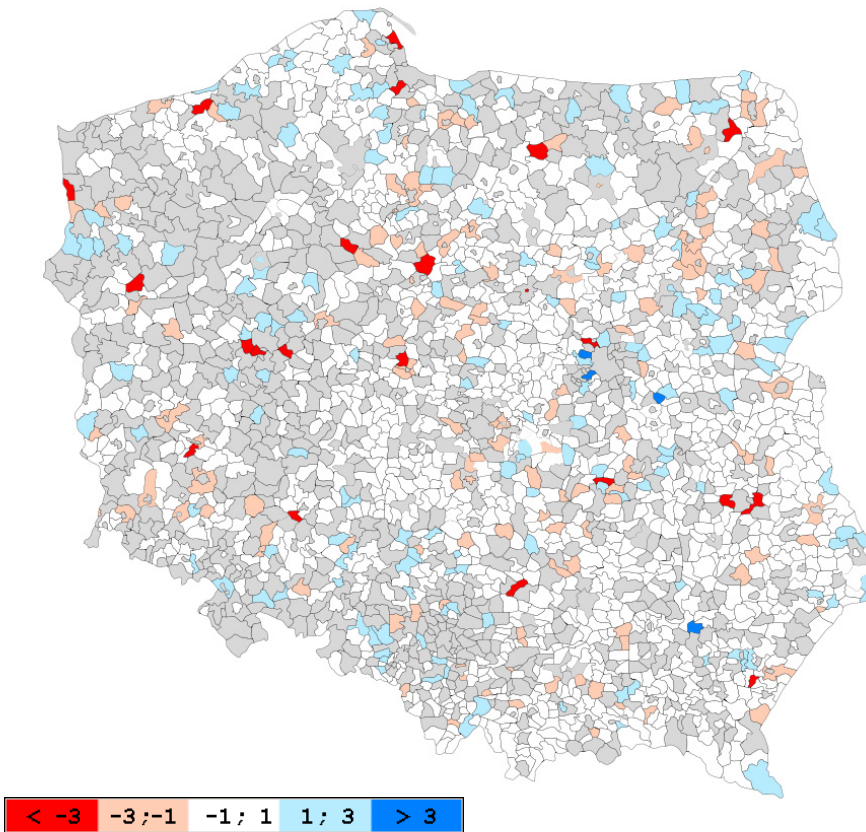
| < -3 | -3 ;-1 | -1 ; 1 | 1 ; 3 | > 3 |

colour codes, corresponding to classes, defined by standard deviation from the average

Figure 3. Rural communes in Poland in 2006 according to the errors in the regression model from Table 1. Colour codes as in Figure 2 denote migrations higher (blue) and lower (pink and red) than expected from the model

Source: own elaboration

This map shows – as expected – a different image from that of Figure 1. Let us remind that here, red and pink colours denote units where migration is lower than expected from the model, while blue and dark blue – where it is higher than "predicted". Now, the suburban areas look no longer that uniform and distinct. One can easily see among the suburban (formally rural) communes the ones, in which, despite the existence of the model-determined conditions for high in-migration, it does not actually take place. They neighbour upon the ones in which in-migration continues at a pace beyond that expected from the model (see the surroundings of Warsaw and Poznań). On the other hand, there are plenty of far-off rural municipalities, where in-migration is higher than expected from the model. These include, in particular, but not exclusively, the ones located in areas attractive in terms of tourism and leisure.
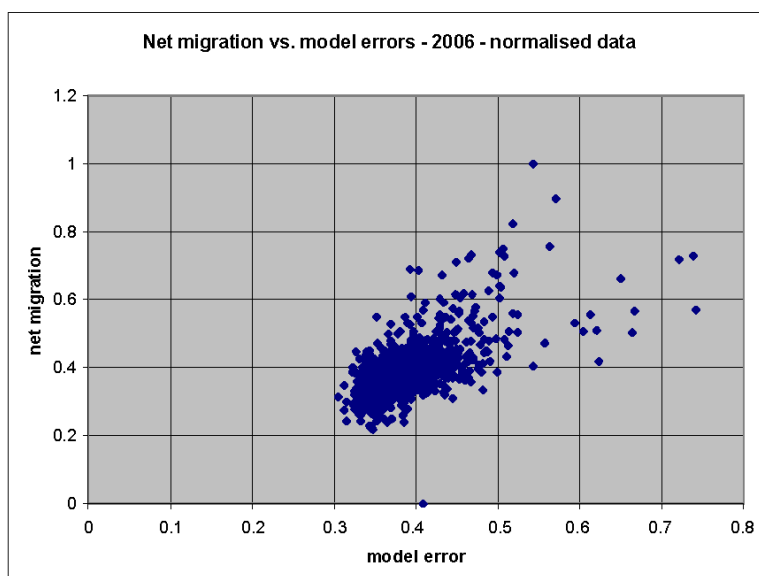

Figure 4. Scatterplot of net migration vs. migration model errors (unitarised data) for Polish rural communes in 2006
Source: own elaboration

Yet, it must be admitted that while the image of Figure 1 is relatively stable in time, the one of Figure 2 is not: the colours move from year to year among the communes very distinctly. This is not to say that one cannot draw definite conclusions from these maps of model errors. Namely, even though the colours move, the general spatial locations of the respective "coloured" units remain largely similar, or even the same. This applies in a particular manner to (a) suburban communes, (b) communes located in tourism and leisure areas, and (c) some "deeply" rural areas throughout Poland. Three kinds of conclusions can be drawn therefrom, namely:

1. migration at the commune level has to be analysed over a longer time horizon, even if to a detriment for the possibility of assessing some dynamic features;

2. there are definite areas, where the intensity of both the phenomena, conditioning migration processes, and migration flows themselves, is distinctly higher, even though volatile, than elsewhere; and

3. there are relatively vast areas of rural communes, where the outmigration (and, apparently, also depopulation) either does not take place, or does this at a pace much slower than determined with the model.

Figure 4, showing net migration vs. model error for 2006, i.e. corresponding to Figures 2 and 3, illustrates well the statement of the relative and specific "stability" of model results. Namely, for all years the image of Figure 4 is the same, displaying a two-way bias in the model: the bigger net migration (in-migration), the bigger the error, both ways, meaning that for high outmigration there might be also high negative error. The bias is, though, decidedly on the positive side, emphasising the role of the most important in-migration sinks.

Models of employment outside of family farming

One of the apparently strange phenomena, observed in Tables 1 and 3 was the role played by employment outside of family farming in the local society. It would seem that the communities with ampler job opportunities outside of agriculture (family farming accounts for virtually entire agricultural workforce in Poland) would be more attractive for in-migrants. Yet, this is not the case (and it may even seem to be on the contrary…). While unemployment appears to be a deterrent, employment (by itself) is not an attractor. Yet, employment (outside agriculture) is treated as a cornerstone of assessment of the current and potential development, also for such units as municipalities. That is why the analysis was extended to, in particular, the models and spatial patterns of employment outside of agriculture in rural communes.

Table 4. Models of employment outside of family farming per 1,000 inhabitants in rural communes of Poland, 2003-2006, for unitarised variables (first type).

| Year	R^2	Constant	Population	Population density	Businesses pc.	Employment per business
2003	0.90	-0.0596	0.0107	0.0142	0.4104	0.9749
2004	0.90	-0.0478	0.0113	0.0064	0.4081	0.9673
2005	0.90	-0.0492	0.0150	0.0065	0.4555	0.9946
2006	0.91	-0.0505	0.0158	0.0084	0.4684	0.9758

Source: own elaboration

It must be added that models of Tables 4 and 5 were calculated without an outlier of just one commune (out of the total of close to 1,600), where the number of persons employed outside of family farming per 1,000 inhabitants has been close to 5,000, due to the manner in which these data are collected and shown, mentioned before.

Table 5. Models of employment outside of family farming per 1,000 inhabitants in rural communes of Poland, 2003-2006, for unitarised variables (second type)

Year	R^2	Con-stant	Popu-lation	Popu-lation density	Busi-nesses pc.	Employ-ment per busi-ness	Com-munal budget pc.	Invest-ment outlays pc.	Unem-ployed pc.
2003	0.90	-0.0537	0.0112	0.0085	0.4077	0.9721	0.0119	-0.0104	-0.0170
2004	0.91	-0.0417	0.0120	0.0004	0.3886	0.9522	0.0423	-0.0047	-0.0121
2005	0.90	-0.0441	0.0153	-0.0008	0.4458	0.9890	0.0076	0.0135	-0.0138
2006	0.91	-0.0446	0.0157	0.0023	0.4558	0.9682	0.0285	-0.0076	-0.0184

Source: own elaboration
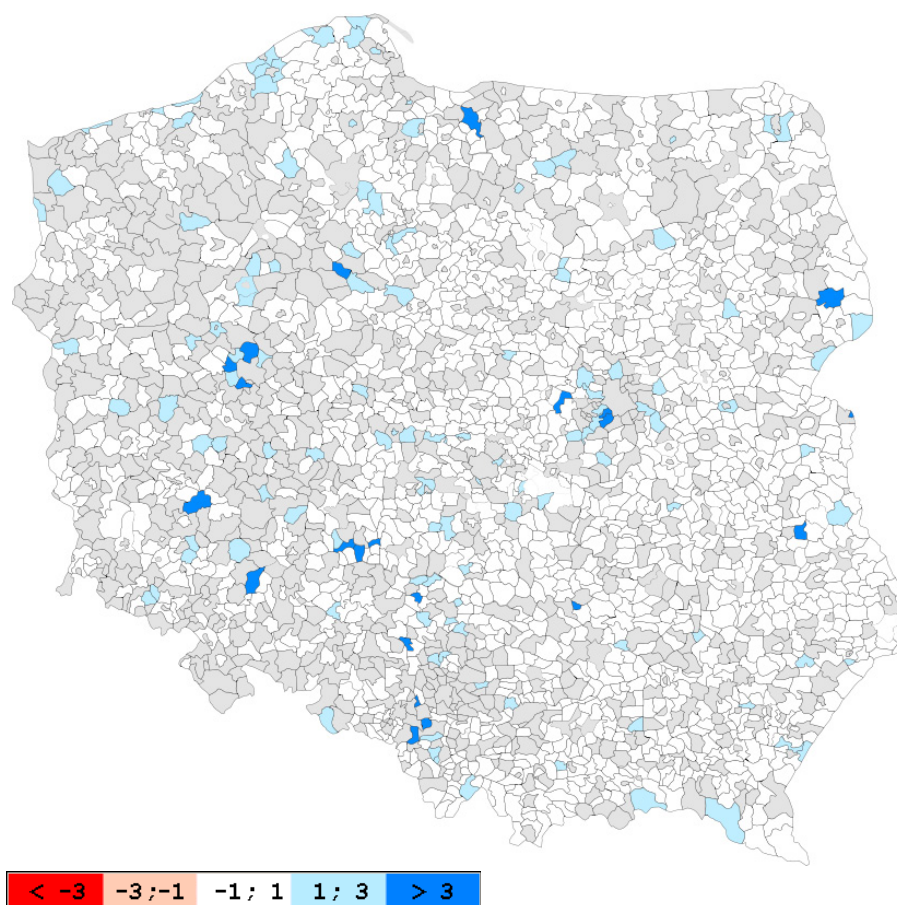
| < -3 | -3;-1 | -1; 1 | 1; 3 | > 3 |

colour codes depending upon intervals related to the standard deviation from the mean

Figure 5. Employment outside of family farming in rural communes in Poland in 2006, according to the categories defined by standard deviation
Source: own elaboration

Rural municipalities in Poland: development types, paths and perspectives

In the light of Tables 4 and 5 it turns out obvious what is the real driving force of employment (known, anyway, very well to any local authority officer): it is the location of a true-to-life employer, rather than any disembodied "community enterprise spirit", and even more so than the "endeavours of the local authorities". No wonder, therefore, that also the mechanism of attraction of migrations had little to do with the number of employed, but, instead, with the more general "wealth & activity" syndrome. Indeed, a factory in a village is rarely an element of attraction by itself, if it is not accompanied by other desired features.
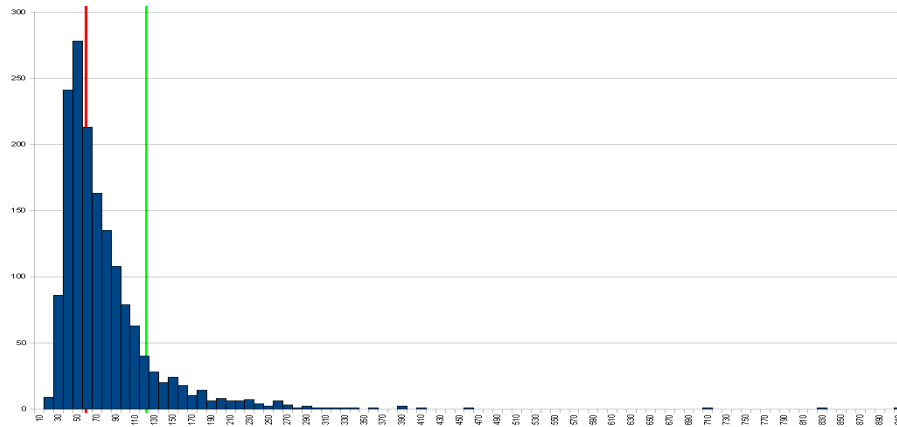

Figure 6. The numbers of rural communes against employment outside of family farming per 1,000 inhabitants in 2006
Source: own elaboration

Figure 5 shows, as in Figure 2, the categories of rural communes in 2006 according to the distribution of values of employment outside of family farming per 1,000 inhabitants, these categories referring to the intervals, defined by standard deviation. Figure 5 appears as striking in that it shows no communes with values of the variable below the mean minus one standard deviation (no red or pink units). The very simple explanation, associated with the distribution of this variable, is shown in Figure 6, and it indicates that, indeed, there is virtually no room available for variable values well below the mean. Yet, in distinction from the bias in the distribution, the models might err on both positive and negative sides – although, given their very high R^2, there should be not much error. For the model of Table 4 this is shown in Figure 7, and for the one in Table 5 – in Figure 8.

Indeed, the vast majority of communes fall into the category of error contained between minus standard deviation and plus standard deviation from the mean. When reading Figure 7 one should remember that model error is defined here as difference: true value-model predicted value. Hence, in communes shown in blue, the actual employment is higher than expected from the model, while in those shown in pink and red – it is lower than model-determined.
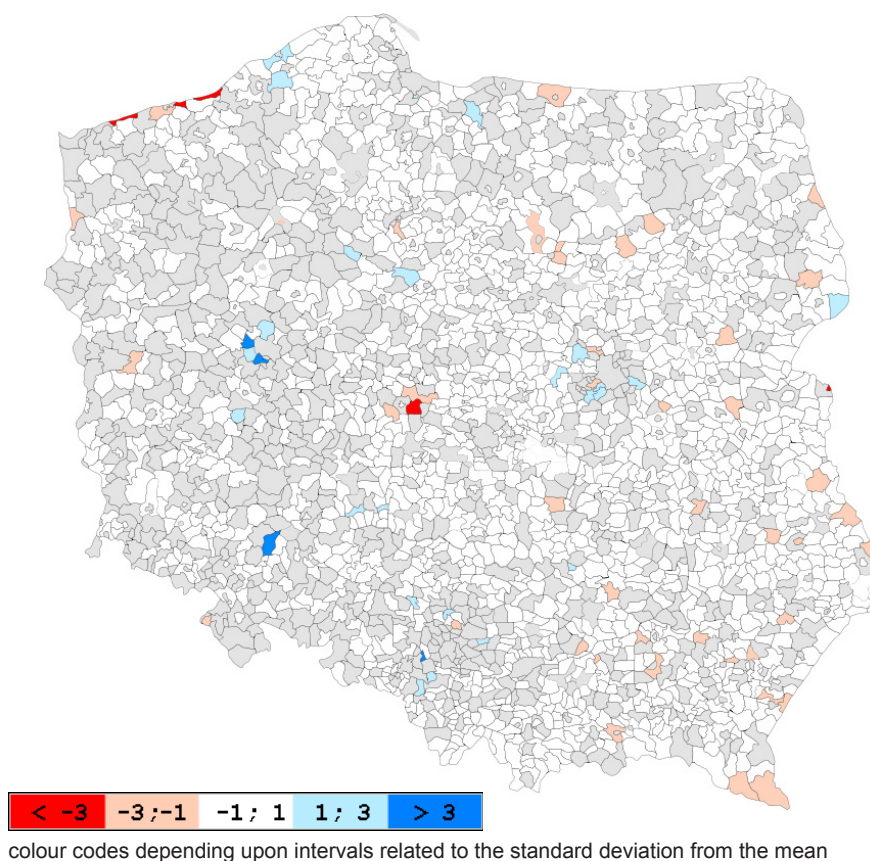
< -3	-3 ; -1	-1 ; 1	1 ; 3	> 3

colour codes depending upon intervals related to the standard deviation from the mean

Figure 7. Error categories for rural communes for the model of employment outside of family farming of Table 4 in 2006
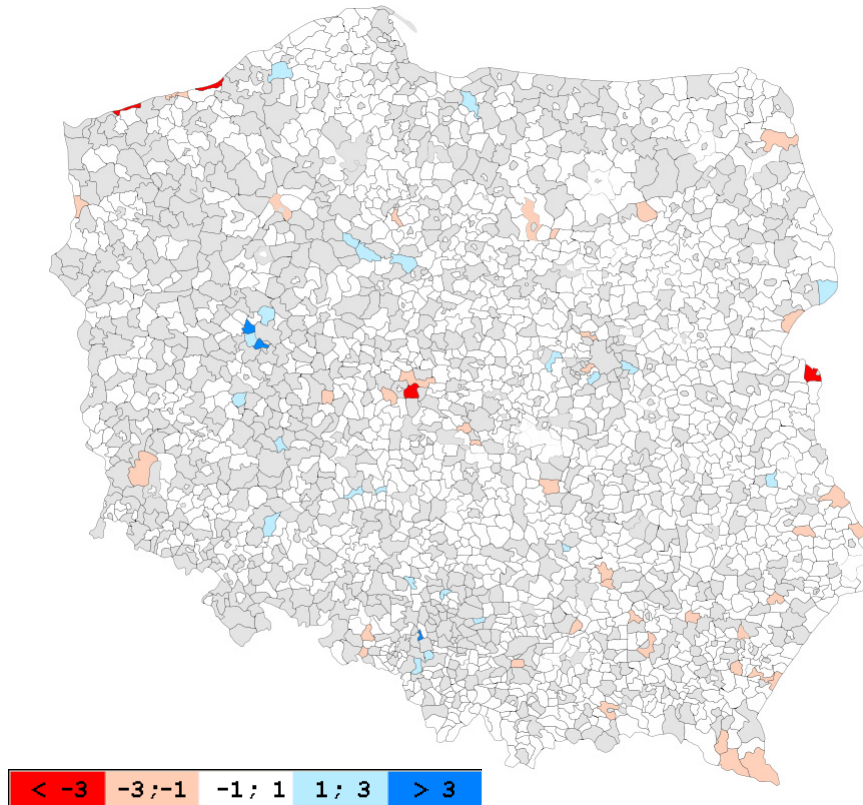Source: own elaboration

Given that the value of employment per business registered is the dominating variable in both models here considered, it might be presumed that the pink and red colours in rural areas often mean that the number of (official) businesses there is low, or very low, even if the number of employed is also low. Again, the peri-urban communes are mostly those, where models underestimated the employment, meaning that the agglomeration syndrome is at work there.

The model error maps for the two models and for consecutive years are very highly similar, especially for the same years (in three out of four cases they are identical!), and so we show here, as Figure 7, the map that differs somewhat at least from Figure 8, while, definitely, preserving all of its essential features.

At the end of this presentation of individual spatial images and particular models, to which they refer, let us note that, obviously, most of the rural communes on the maps, are contained within the interval [mean-standard deviation; mean+standard deviation] (white colour). It is usual, for distributions

mapped, that 10-20% of communes appear as coloured. Yet, if we consider several distributions and maps, "telling" classification encompasses much more important portion of the population.

Thus, in the next section of the paper we shall describe the approach to verification of the initial rough hypothesis and provide an illustration for a map that comes closer to being directly useful in such verification.

< -3	-3;-1	-1; 1	1; 3	> 3

colour codes depending upon intervals related to the standard deviation from the mean

Figure 8. Error categories of rural communes for model of employment outside of family farming of Table 5 in 2004

Source: own elaboration

Synthetic patterns and images

Let us first emphasise that it was by no means the goal of the study to somehow "classify" the municipalities in the strict sense of the word, i.e. to define classes (corresponding to "types") and assign each municipality to a class. Rather, the initial hypothesis was conceived as generic, i.e. leading, after verification, refinement, further distinctions etc., to establishment of the municipality classes as dimensions, similarly as it is often done with functional distinctions

(see, e.g. Bański and Stola, 2002, or Bański, 2003), and development measures (as, e.g., in Bański, 2008). In a somewhat different perspective, one could determine fuzzy assignments to classes, so that a commune could belong to various classes with various degrees of membership. Both these approaches can be facilitated by the direct use of the standard-deviation-based categories, which we referred to in the preceding sections.

The two kinds of formalisation could, then, take the forms shown below, where we assume that $x_{ik} \in [0,1]$ denotes the value taken by the characteristic k, $k = 1, 2, 3,\ldots$, for the municipality i, and that the characteristics considered arise from the variables here accounted for (migration, employment, budget,…) and the statistical properties, related to them (e.g. categories, defined with respect to mean and standard deviation).

Thus, in each case we would be dealing with $k = 1, 2, \ldots, 6$ types of characteristics, as in the initial hypothesis, in the first formalisation treated simply as dimensions:

$$\boldsymbol{x}_i = (x_{i1},\ldots,x_{i6}), \text{ with } x_{ik} \in [0,1], \tag{1}$$

so that we deal with points x_i in a multidimensional unitary cube, the coordinates $\boldsymbol{x}_{ik}$ possibly taking just a few discrete values, like in the maps presented. In the second case, of fuzzy representation, an additional limitation would have to be introduced, namely:

$$\boldsymbol{x}_i = (x_{i1},\ldots,x_{i6}), \text{ with } x_{ik} \in [0,1], \text{ and } \Sigma_k x_{ik} = 1 \;\forall i, \tag{2}$$

the latter condition meaning that a municipality has to be "distributed" among the fuzzy classes so as to form ultimately a whole.

With such a procedure in mind, a number of increasingly "synthetic" maps were produced, aiming at (i) a better representation of the classes or types mentioned in the initial hypothesis, which are by definition not unidimensional, and so have to be reflected through more comprehensive measures, and (ii) more exhaustive enumeration of communes than in the preceding maps, where mainly the extremes were made explicit. An example is shown in Figure 9, resulting from models of migration and employment (Tables 1 and 4).

The categories, appearing in Figure 9, were defined in the following manner: like in Figures 3 and 7, respective model error values were quantified according to the mean and standard deviation, i.e. (μ denotes the mean, and σ denotes the standard deviation):

Value of error:	$< \mu - 3\sigma$	$\in [\mu - 3\sigma, \mu - \sigma]$	$\in [\mu - \sigma, \mu + \sigma]$	$\in [\mu + \sigma, \mu + 3\sigma]$	$> \mu + 3\sigma$
"Score":	-2	-1	0	+1	+2
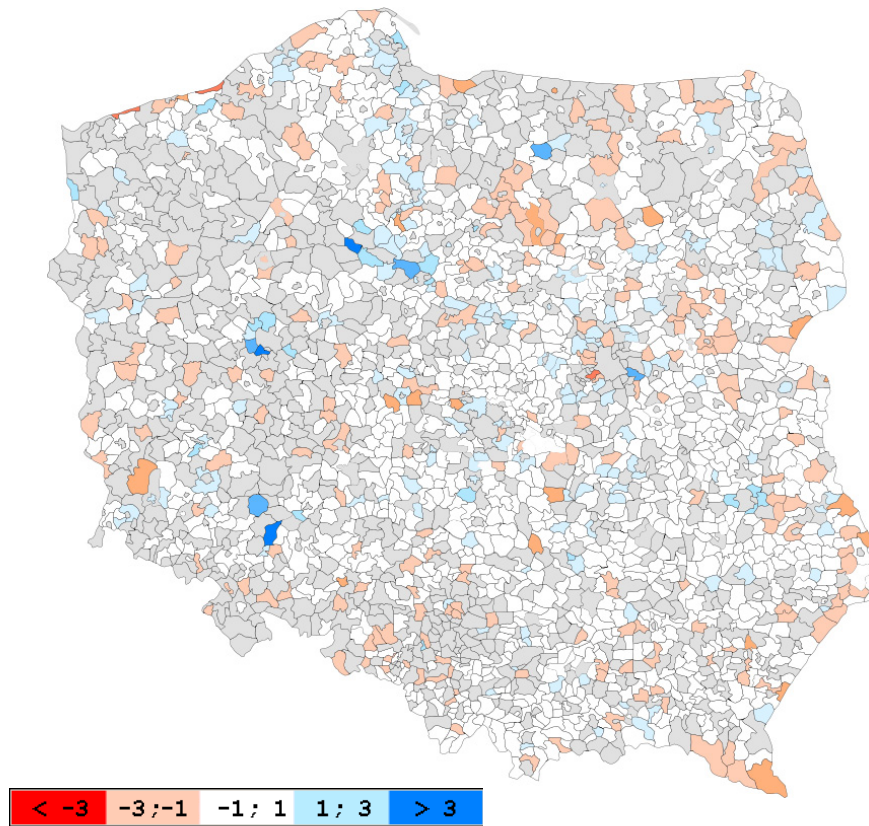
| < -3 | -3;-1 | -1; 1 | 1; 3 | > 3 |

colour codes depending upon intervals related to the standard deviation from the mean

Figure 9. Standard-deviation-based superposed categories for errors of models from Tables 1 and 4. General scale of colours as before (see detailed explanations in the text)
Source: own elaboration

and these "scores" were simply added. Thus, the potential scale ranging from -4 = -2 -2 up to +4 = +2 +2, arose. The "statistics" of communes corresponding to particular values on this scale are shown in Table 6.

So, the "neutral" group (0 score), which can be considered to comprise the candidates to class 5 ("true rural communes, with viable, but not outstanding agriculture") is still predominant (more than 70% of rural communes). Yet, the "lower end" (peripheral, marginal, and problem areas, mainly, but not exclusively, candidates to class 6) becomes quite visible, with 10-15% of units, as well as the "density end", with close to 20% of units (candidates to classes 1 through 4).

The image of Figure 9 is more comprehensive in terms of both content, as resulting from two models, and composition of categories shown. In particular, it can easily be seen that with respect to both variables considered

(net migration and employment outside of family farming) the "recreational" municipalities rarely fare "better than expected" (see the coastal areas, the lakelands, as well as mountains). At the same time, the previous observations, concerning peri-urban communes remain valid (including diversification), and there are indeed plenty of rural communes outside of urbanising areas, which tend to fare "better than expected".

On the basis of a series of similar exercises it is hoped that the complex (fuzzy) classifications of the kind illustrated by formula (2) will be ultimately established, including the dynamic aspect of characteristics, even if with a number of reservations, concerning the source data, the period of study and the simplifications introduced.

Table 6. Numbers of communes, corresponding to the particular values of compound real value deviations and model error scale for migration and employment models of Tables 1 and 4, year 2006

Sums of scores	Deviations of dependent variable values from the mean	Model errors
-4	0	0
-3	0	3
-2	1	21
-1	79	210
0	1279	1177
+1	179	148
+2	37	22
+3	12	5
+4	2	3

Some preliminary conclusions

Within the direction of work here considered, some preliminary conclusions, concerning the hypothesis initially forwarded, could be formulated, even though with utmost care. It must be added that, for the sake of limited space of the paper, we do not quote here, e.g. the classifications of communes based on joint consideration of several variables and model results ("synthetic classifications"), like the one directly associated to Figure 9. Actually, even though quite informative, they tend to be much less intuitive and legible than the images and tables here provided.

Table 7 sums up the findings, some of which are clearly visible from the material here shown, and some other are the consequence of additional information, resulting from the study reported. As can be noticed, there are several places where conclusions point out, actually, the directions of future work.

The descriptions under the heading of "Initial hypothesis" in a way complement the one, given in Section 2 of the paper, with additional insights. Then,

"Observations" contain mainly the observed differences with respect to the initial suppositions, or specific findings, which make the image more concrete.

Table 7. The initial hypothesis and the preliminary findings.

Commune "type"	Initial hypothesis	Observations
1. metropolitan / suburban	High and increasing density of population and activity; bordering upon large cities	Some metropolitan areas are very highly pronounced, some are much less; their shapes differ; so does, quite distinctly, the situation of particular communes, both in space – with regard to the same urban centre, and in time
2. urbanising	High and increasing population; activity level higher than average; location close to local centres or within broader urbanisation zones	Much less pronounced, but visible and relatively extensive areas; some of them developed virtually without urban centres; situation distinctly differs across them
3. tourism & leisure areas	Incomes and jobs not necessarily registered; other symptoms of activity present, including, potentially, immigration	Not all supposedly benefitting areas visible (grey economy without secondary effects); some give mixed signals, both positive and negative (the latter might, again be the artificial effect of grey economy)
4. local resource & factory communes	High levels of employment, not always accompanied by other activity indicator values	Very few visible (single communes); also giving mixed (positive and negative) signals
5. agricultural	Relatively low activity indicators, but not excessively low (net migration negative, but within middle limits)	Major part of rural communes, with somewhat differentiated, but not anyhow extreme characteristics; outmigration within middle limits, some immigration; an important share of communes with positive "balance"
6. peripheral / marginal	Very low values of indicators, with high outmigration and extremely low employment	Visible, but not necessarily only in negative sense; mixed signals from many of them

Source: own elaboration

Further investigations should especially be oriented at these groups of units, which are referred to here as transmitting "mixed signals" or featuring, within a given group, high differentiation (like, e.g., in "type" no. 1).

Concerning potential policy design, attention ought to be paid to the "types" of communes (and their internal differentiation), but this does not necessarily mean that the policy instruments must be "tailor-made". First, the consequences of the application (or lack thereof) of these instruments to different types of communes ought to be analysed.

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