THE INFLUENCE OF EUROPEAN UNION'S SUBSIDIES ON THE DEVELOPMENT OF RURAL VILLAGES IN THE CZECH REPUBLIC

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Abstract

This paper is aimed on the evaluation of the impact of subsidies from European Agricultural Fund for Rural Development, Structural funds and Cohesion fund on the development of rural areas. A case study on the rural villages (with less than 2000 inhabitants) in Liberecký region in the Czech Republic was performed. We chose indicators in relation to the rural development and to the rural policy goals from economical, social, demographic, infrastructural and geographical areas. Subsequently they were utilized to group the municipalities by hierarchical cluster analysis using Euclidian distances and Ward method of clusterization. The villages were ranked according to their development state into three groups. The impact of subsidies on the development level was assessed by logit model. It was proved that obtained subsidies lower the odds that the village will belong to the group of less developed municipalities against the odds that it will fall into the category of the most developed. However, the impact is not statistically significant.

Key words: Rural Development Policy, Cluster Analysis, LOGIT, ANOVA

JEL Code: Q18, C54

Introduction

Rural development policy has gained its importance with decline of economic significance of agriculture. "Over the past decades, major changes have taken place in Europe's rural areas. These changes included contrasting developments like depopulation and land abandonment in some regions, and urbanisation and agricultural intensification in others," (Westhoek et al., 2006). Original point of view where the agricultural policy was seen as sufficient instrument to support rural development has been changed to multisectoral. "With the introduction of the second pillar of the Common Agricultural Policy (CAP), a new paradigm of multi-dimensional rural development has emerged in Europe. Rural development is no longer the "monopoly of the farmers," (Korf, Oughton, 2006). The second pillar of the CAP which is

"EU's main funding instrument explicitly supporting rural development across the whole territory" (Bradley et al., 2010) are implemented National Rural Development Programmes. These consist of "three so-called "axes" with the objectives of improving the competitiveness of the agricultural and forestry sector (Axis 1), improving the environment and the countryside (Axis 2), and improving the quality of life in rural areas and encouraging diversification of the rural economy (Axis 3)" (Margarian, 2013). Structural funds (SF) offer mainly capital grants to different kinds of regional programmes and projects.

The article focuses on both policies as they jointly contribute to the rural development. Firstly, the overview of the objectives of the programmes supporting the rural development is given. The results of researches on subsidies' efficiency are confronted next. On the basis of literature review, the relevant indicators are chosen. The methodology is outlined in the second section. Results are drawn pursuant to statistical and econometrical analysis. The last section summarises the conclusions.

The goals of the RDP are: to increase the quality of life in rural areas via improvement of facilities such as building of water treatment plants, sewages, water infrastructure and local roads, to ensure higher income level of the inhabitants through the jobs creation and diversification of the rural economy, e.g. by support of rural tourism. (MoA, 2013) Other objectives include the creation of growth conditions in rural areas via the investments into infrastructure and look of the municipalities. The awareness of the local inhabitants of the necessity of environmental protection and of cultural values of the area contributes to the increasing identity of the locals and cohesion with the area and cultural heritage. (MoA, 2013). Cohesion Policy has three main objectives: the support of convergence of the regions with the GDP per capita lower than 75 % of the EU average, competitiveness and employment growth and territorial cooperation. (Campo et al., 2007) "The aim of the support is to increase activities of regions towards the insurance of harmonic and well-balanced development, reduction of unemployment, development of human resources, environment protection etc." (Jánský, 2012)

Policy evaluation is done by Member States, although it is often criticized. "Regarding the chances for increasing efficiency of the structural policy by extended impact assessment and evaluation, one should keep in mind that there is still a gap existing between theoretical requirements for comprehensive programming of the regional development process on the one hand, and the rather poor actual state of knowledge on causalities between policy inputs and the related outputs as a pre-condition for complete evaluation on the other hand." (Schrader, 1994) Similarly Margarian (2013) stresses the theory basement which could help to further

develop functioning of the rural development policies. Bradley et al. (2010) state that there is no track of the relation between rural development policy objectives and its results. Therefore this paper compared the goals and the results of the policy.

1 Methodology

The case study is elaborated for rural municipalities (less than 2000 inhabitants) in Liberecký region. The research assesses EU's subsidies from 2007 till the end of 2012. Particularly were considered subsidies from: European Regional Development Fund, European Social Fund and Cohesion Fund, and the Rural Development Programme (RDP) obtained by the municipalities via Local Action Groups. The subsidies were assigned to each village in Liberecký region for the period 2007–2012. The development state of a municipality was assessed by various economic, social, demographic, infrastructural and geographic indicators. Data were obtained from State Agricultural Interventional Fund (SAIF), Ministry of Regional Development (MRD), Czech Statistical Office (CZSO), Ministry of Finance (MFCR) and National Network of the Local Action Groups (NSMAS) and Google maps for the most recent available year. The indicators, their descriptive statistics and data sources and years are displayed in Tab. 1.

Because the indicators were measured in different range the data were standardized by *Z* transformation as suggested by Romesbourg (2004). Then the municipalities were grouped by hierarchical cluster analysis. It "is a method for displaying the similarities and dissimilarities between pairs of objects in a set," (Romesburg, 2004). "The aim of cluster analysis is to minimize variability within clusters and maximize variability between clusters," (Poledníková, 2013). The distances between objects were computed by Euclidean method based on Pythagoras' theorem as the "Most of the existing clustering methods are typically built on the Euclidean distance and geared toward analyzing continuous response" (Baolin, 2012). We used Ward's method which does not combine the two most similar objects successively. Instead, those objects whose merger increases the overall within-cluster variance to the smallest possible degree are combined," (Mooi and Sarstedt, 2011).

The number of clusters can be established by expert guess, but more often is used the Agglomeration Schedule. This provides coefficients with information when the clusterization shall be stopped (when "the increase in the coefficients between two adjacent steps is large" (Poledníková, 2013)). The agglomeration stopped when 3 clusters were created.

Tab. 1: Indicators with descriptive statistics and data sources

Economic indicators	Mean	Minimum	Maximum	Std. dev.	Source; year
Unemployment rate (%)	11.64	2.11	25.58	4.94	CZSO, www.czso.cz;
Unemployment rate of graduates (%)	0.05	0.00	0.19	0.05	31st Dec 2011
Income of the municipality (CZK)	10935.20	1319.17	43851.62	9440.91	MFCR, www.mfcr.cz; Dec 2011
Share of liabilities on the total assets (%)	6.03	0.06	37.53	6.97	
Total liquidity	12.83	0.00	90.10	20.73	
Number of accommodation facilities per 100 inhabitants	0.02	0.00	0.26	0.04	CZSO, www.czso.cz; 31st Dec 2011
Social and cultural indicators					
Turnaround in the last local council elections	62.81	39.38	81.70	10.36	CZSO, www.czso.cz; 2010
Local Action Group (LAG) or microregion membership	2.21	1.00	4.00	0.52	NSMAS, nsas.cz, www.risy.cz; Nov 2012
Demographic indicators					
Number of inhabitants	597.92	141.00	1375.00	344.68	CZSO, www.czso.cz; 1st Jan 2011
Number of inhabitants in productive age	328.46	66.00	846.00	200.10	CZSO, www.czso.cz; 31st Dec 2011
Share of inhabitants in productive age (%)	0.60	0.50	0.75	0.05	
Average age	37.90	34.70	44.80	2.58	
Share of inhab. in age 0-14 on the total number of inhabitants (%)	15.81	10.61	20.61	2.11	
Share of inhab. in age over 65 on the total number of inhabitants (%)	14.52	8.36	25.56	3.45	
Net migration	4.13	-32.00	22.00	10.77	
Share of natality on the total number of inhabitants	0.01	0.00	0.03	0.00	
Share of death on the total number of inhabitants	0.01	0.00	0.02	0.00	
Population density (inhabitants / km^2)	97.55	14.05	1809.09	279.44	http://mesta.obce.cz; Sept 2012
Infrastructural indicators					
Presence of post office	0.69	0.00	1.00	0.46	http://mesta.obce.cz;
Presence of the school	0.33	0.00	1.00	0.47	Sept 2012
Presence of healthcare centre	0.26	0.00	1.00	0.44	
Sewage (water treatment plant)	0.18	0.00	1.00	0.38	
Water treatment plant	0.95	0.00	1.00	0.22	
Gasification	0.13	0.00	1.00	0.33	
Geographical indicators					
Acreage	1251.74	44.00	3025.00	695.97	http://mesta.obce.cz; Sept 2012
Distance from municipality with extended powers (MEP)	13.53	3.60	31.00	7.17	Google maps, maps.google.com;
Distance from Liberec (district's capital)	42.69	7.80	77.00	20.04	Aug 2012
Share of agricultural land (%)	54.47	8.35	81.28	16.96	CZSO, www.czso.cz; 31st Dec 2011

Source: own elaboration

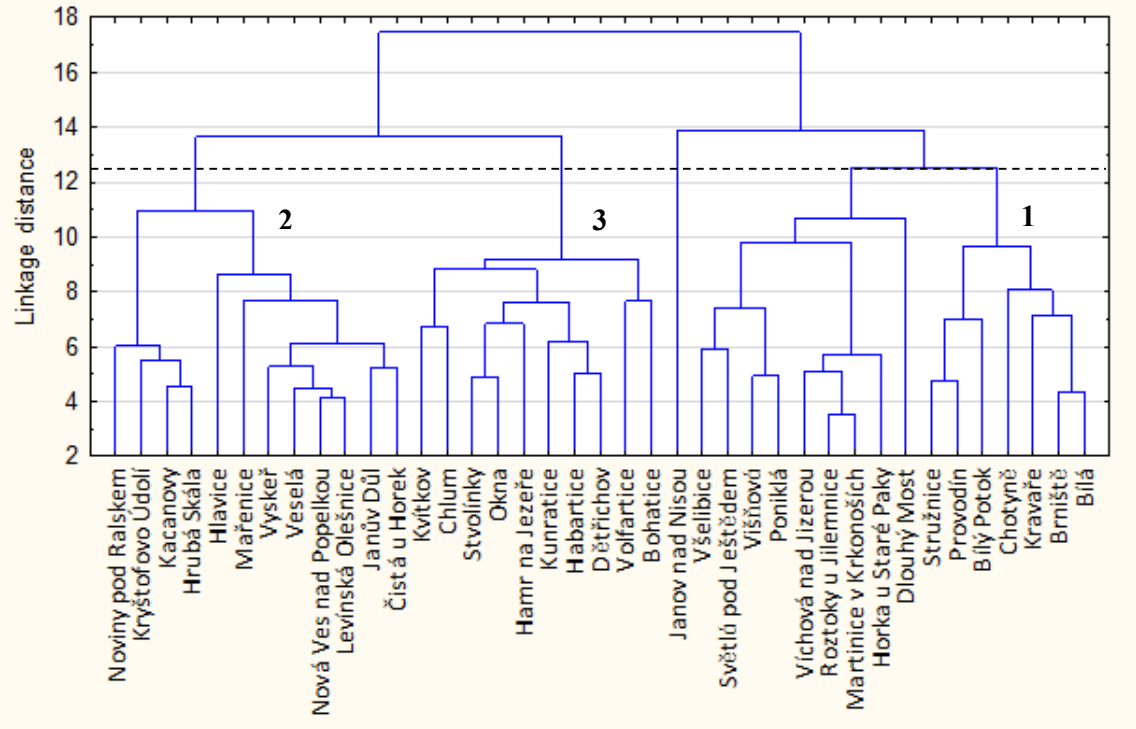
The amount of subsidies was assigned to each cluster. It was tested by ANOVA if the subsidies in each cluster are statistically significantly different (H_0: no statistically significant difference among mean values of the subsidies in each group). The impact of the subsidies on the odds that the municipality would achieve particular development state was assessed using multinomial logit model as the endogenous variable is of unobserved nature and in a form of alternatives. After the estimation by maximal likelihood method the model was verified. Cluster analysis was elaborated in Statistica 64 version 10, ANOVA in Statgraphics Centurion XVI and econometric model in Gretl version 1.9.8.

2 Results

The indicators for cluster analysis were selected in relation to the policy goals. Job creation was expressed by the unemployment rate, the financial situation of the municipality by income, share of liabilities on total assets (debts) and total liquidity (the ability to pay the commitments). Also the potential for two most common economic activities in rural areas (tourism and agriculture) was included. Tourism potential was represented by the number of accommodation facilities per 100 inhabitants. The level of cohesion of the locals with the area was measured by the turnaround in the elections and by participation in LAGs. Demographic variables influence the potential for growth and development of the area. The higher is the share of people in productive age, the lower is the average age; the higher is the share of children (age 0–14) and the lower of elder (age over 65), and if the net migration is positive, the better is the development state. Natality and mortality influence the number of inhabitants. The impact of the population density can be positive in terms of more compact settlement, but can negatively affect the life comfort. The quality of life as the main goal of the rural development policy was measured by the infrastructural indicators: the presence of post office, school, healthcare centre, sewage, water treatment plant and gasification. The land use is represented by share of agricultural area, the size of the village by its acreage and the development potential by the distance from municipality with extended powers (MEP) and from Liberec.

A cluster analysis was performed for 39 municipalities in Liberecký region. The dendrogram in Fig. 1 shows how they were consequently merged together. The Euclidean distances are measured on vertical axis, while horizontal axis contains the name of the municipalities. The clusters are homogenous according to the indicators (attributes) and imply that the municipalities in one group are similar in their development stage.

Fig. 1: Dendrogram for municipalities grouped according to indicators



Note: Dendrogram for 39 variables, Ward's method, Euclid. distances. Source: own calculation

The cut of dendrogram was done at Linkage distance of 12.497. It created three clusters. The group number 1 which was created at the furthest distance consisted of 16 with one municipality added extra. Second cluster had 10 villages, third 12. Results of the analysis are displayed in Tab. 2. The first contained the municipalities which were the closest to their MEPs. The density as same as net migration were the highest. Higher share of newcomers could result in the lowest election participation. Share of children was almost the same as share of elderly people, while the percentage of people in productive age was the highest from all groups. The unemployment was low and of graduates the lowest. The mortality equalled to natality. The shares of school, sewage and health centres were the highest as same as the average income of municipality. On the other hand, liquidity was the worst and share of debts was the highest. This group can be regarded as productive, rich, and equipped, close to the centres with highest potential for development. The average number of inhabitants in the second group was the lowest. All municipalities were distant to MEPs, but closest to Liberec. Net migration was the lowest, which could lead to increased participation in local elections. Natality exceeded mortality, but the share of young was the lowest. Share of elderly people the highest, hence, the average age too. The group had the most developed water infrastructure. In summary it is old, traditional, further from the centres with limited potential

for development even for the agricultural activities, as the share of land per capita was low and the finances obtained by municipality the lowest. The third group had the smallest acreage and was the furthest from Liberec. It consists of relatively young people. Natality and mortality were the lowest. The potential for agriculture was higher than for tourism. As same as in previous group, none of the villages had gasification. This cluster is in the best economic situation thanks to the lowest debt ratio.

Tab. 2: Descriptive statistics of clusters

Municipalities' cluster	Group 1	Group 2	Group 3
Economic indicators	Mean	Mean	Mean
Unemployment rate (%)	10.04	9.86	16.50
Unemployment rate of graduates (%)	0.03	0.07	0.05
Income of the municipality (CZK)	16827.19	5527.66	8461.36
Share of liabilities on the total assets (%)	8.86	4.17	3.45
Total liquidity	4.85	12.61	26.65
Number of accommodation facilities per 100 inhab.	0.02	0.01	0.01
Social and cultural	Mean	Mean	Mean
Turnaround in the last local council elections	58.05	69.20	63.29
LAG or microregion membership	2.18	2.17	2.30
Demographic indicators	Mean	Mean	Mean
Number of inhabitants	888.94	351.92	398.40
Share of inhabitants in productive age (%)	0.61	0.59	0.59
Average age	37.30	40.42	35.89
Share of inhab. in age 0-14 on the total number of inhabitants (%)	15.80	14.82	17.01
Share of inhab. in age over 65 on the total number of inhab. (%)	14.60	17.21	11.17
Net migration	6.18	2.50	2.60
Share of natality on the total number of inhabitants	0.01	0.01	0.01
Share of death on the total number of inhabitants	0.01	0.01	0.01
Population density (inhabitants / km^2)	173.52	33.77	44.92
Infrastructural indicators	Nr. of ihab. per 1	Nr. of ihab. per 1	Nr. of ihab. per 1
Presence of post office	944.50	3022.40	2518.67
Presence of the school	1511.20	7556.00	15112.00
Presence of healthcare centre	1679.11	0.00	15112.00
Sewage (water treatment plant)	2518.67	0.00	15112.00
Water treatment plant	888.94	1259.33	1889.00
Gasification	3022.40	0.00	0.00
Geographical indicators	Mean	Mean	Mean
Acreage	1478.94	1123.67	1019.20
Distance from MEP	12.50	15.06	13.44
Distance from Liberec (district's capital)	41.16	39.92	48.60
Share of agricultural land (%)	57.13	48.18	57.48

Source: own elaboration

The first group obtained the most of the finances from SF and CF (4 723 CZK/capita), but the least from EAFRD (1 414 CZK/capita). Second group gained 2 899 CZK/capita and third

1 548 CZK/capita from EAFRD. This suggested that the subsidies from ERDF, ESF and CF as they usually fund more expensive projects were more obtained by larger and richer municipalities closer to the centres. The equality of subsidies' distribution was tested by ANOVA. The F-ratio of 1.2392 and the p-value (0.3017) suggested that there is not a statistically significant difference between the mean of the subsidies from ERDF or CF at the 0.05 level of significance. Hence, the distribution of subsidies from SF and CF is not statistically significantly different from each other. The situation is similar in case of subsidies from EAFRD. Critical value of the test F = 2.64 was lower than the tabled value $F^* = 2.84507$, hence the null hypothesis could not be rejected.

The first group can be considered to have the best development potential. Therefore, it was taken as the reference one. The effect of the subsidies on the development level was modelled by multinomial logit model. The results (Tab. 3) are interpreted in odds that village municipality receiving certain amount of subsidies will belong to particular category against the odds that it would fall to the reference group. The development category was predicted correctly in 53.8 % cases. Likelihood ratio test rejected H_0 that all coefficients are jointly equal to 0 [p-value = 0.0018]. Except for a constant, only statistically significant coefficient was the one for X_3. Negative signs of all coefficients imply that increase in the number of received subsidies decrease the odds of the particular municipality being in lower development category vis-a-vis the reference category. The more subsidies the higher are the odds that the municipality achieve higher development category. Hence, grants from SF, CF and EAFRD helped to the development of the villages.

Tab. 3: Multinomial Logit Model, observations 1-39; Stand. errors based on Hessian

	Coef. (SE)	*z [p-value]*		*Coef. (SE)*	*z [p-value]*
Development = 2			Development = 3		
X_1	0.81841200 (0.80285600)	1.0194 [0.30802]	X_1	2.5868100 (1.4839400)	1.7432 [0.081300]*
X_2	-5.00939e-07 (3.99932e-07)	-1.2526 [0.21037]	X_2	-1.09329e-05 (2.0492e-05)	-0.5335 [0.593670]
X_3	-6.59471e-07 (5.62455e-07)	-1.1725 [0.24100]	X_3	-2.13968e-06 (1.07042e-06)	-1.9989 [0.045620]**

Note: X_1 – constant, X_2 – Subsidies from ERDF, ESF, CF, X_3 – Subsidies from EAFRD.

Source: own calculation

Conclusion

The article analysed the impact of subsidies on the municipalities' development. The research included villages with less than 2000 inhabitants in Liberecký region which received

subsidies from SF, CF or EAFRD. The villages were clustered according to indicators from economic, social, demographic, infrastructural and geographical area which corresponded to the policy development objectives and reflected the targets of the programming documents. Cluster analysis created three groups of municipalities. The first one was a reference group as it had the highest development potential thanks to the facilities, high average income and low unemployment. Unfavourable demographic indicators were typical for the second group, but in the third cluster the population was the youngest. The height of subsidies was assigned to each cluster. The impact was assessed by multinomial logit model. The coefficients suggested positive effect of subsidies from all funds. The increase of subsidies decreased the odds that the municipality belonged to the less developed village against the probability that it would fall into the first the most developed category. However, the impact was not statistically significant in the most of cases. Therefore the conclusions are valid only for the given sample.

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