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Original Research Article **Location of a Competitor and the Regional Innovation Activity of Industrial Systems in Transition Country – Poland’s Case Study**

ABSTRACT

Aims: Spatial proximity with competitive enterprises is a factor influencing the acceleration of the technological progress in industrial systems in the most developed countries, but is it like that also in Poland? The main objective of the conducted studies was the identification of the effect of distance from the nearest competitor on the innovation activity of the selected regional industrial systems in Poland..

Study design: Surveys were conducted in the years of 2007-12 on a group of 2 434 industrial companies in four diverse provinces located in different parts of the Poland.

Place and Duration of Study: Department of Economics and Management (university in Zielona Gora), between October 2007 and June 2012.

Methodology: Group of 2 434 industrial companies in four diverse provinces located in different parts of the Poland - Masovian, Greater Poland, Silesian and Swietokrzyskie. The methodical side of analyses was based on the theory of probability – the probit modelling.

Results: The obtained results of the analyses, based on the theory of probability, indicate that both the location and the current level of the economic development of the analysed provinces do not influence the diversity of the innovation activity of the regional industrial systems. Therefore, the discussed regularities in Poland have the system nature and are common for all provinces in the country. Creating clusters in the horizontal grasp in Poland, taking into account the obtained results of studies, will be extremely difficult to achieve. The knowledge deficit and low own abilities create areas of local system technological gaps. The regional level in any case did not show significant statistical co-dependencies, what proves that this level of aggregation currently remains neutral for the implementation of the innovation activity.

Conclusion: The obtained research results indicated a different effect of the spatial proximity of competitors in Polish regions on the innovation activity of the industrial systems compared to the most developed countries

Keywords: innovation, competitor, system, region, industry, transition country, Poland

1. INTRODUCTION

Sources of the companies’ advantage within the cluster and the degree of their concentration are dependent on balance between the competition and cooperation. There is no contradiction between cooperation and competition. Cooperation between companies may help increase their innovation level, in order to achieve or maintain their comparative

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23 advantage. For this reason, the benefits from cooperation may outweigh the negative effects
24 associated with the “curvature” of competition and diseconomy of the scale [10].

25 Research works of M. Dodgson and S. Hinze on the increase of importance of the horizontal
26 cooperation and developed by them set of indicators suggest that the understanding of the
27 nature and importance of competition and the spatial proximity for the labour division in
28 innovations, and the quality and effectiveness of the regional innovation systems are still
29 unclear [4].

30 The innovation and cluster policies are connected in parallel with different components of the
31 regional network of innovation, they favour the horizontal linkages, to stabilise the system
32 habits, what is reasonable in highly developed countries. Interactions shaping the innovation
33 habits occur in the “catching up” type of countries, however more in the vertical than
34 horizontal systems. The latter are naturally an incidental phenomenon. Unlike in countries
35 characterised by a large, calculated for a few decades, technological gap. Thus, it is not a
36 system anomaly, but a typical backwardness in the development of institutional
37 mechanisms, which require time.

38 The relatively high degree of concentration of cooperative compounds for the vertically
39 unrelated companies in the same region, means the relatively high role, which is for the
40 innovation activity played by the geography economy. This is consistent with the results of
41 many analyses showing that the innovation activity in a given technological field aims at the
42 high concentration in space [6].

43 M.E. Porter in the part of his studies on the competitive advantage noted that many states in
44 the USA and regions in Europe have oriented their policies towards the promotion of
45 cooperation between enterprises [5]. The approach of local authorities involving the
46 preference of the support for horizontal cooperation networks at the expense of the vertical
47 ones is not clear in the foreign literature, not to say incorrect, and inclining towards the
48 advantage of the specific solutions should have strong fixation in the studies conducted in
49 particular countries, taking into account their specificity.

50 Trust strengthens mutual benefits resulting from the relations between companies. This
51 confirms the thesis that it can be stronger in geographically concentrated networks than in
52 case of the distributed relationships [2].

53 The horizontal local networks should at the same time have essential links with the “outside
54 world” in order to absorb knowledge generated outside the region to boost its innovation
55 activity. Concentration to a greater or lesser extent on local connections may influence the
56 worsening of the competitive position of companies [9].

57 Empirical analyses of the relations between the habit of cooperation and the quality of the
58 innovation system in the regional perspective do not lead to the clear conclusion that the
59 focus on cooperation in the region determines the innovation activity [8]. Research
60 conducted by M. Fritsch in the regions of Vienna and Slovenia showed that “cooperation is
61 positive for innovation”, but this hypothesis is too harsh to confront it with reality.

62 There is a further need for studies, which will test the empirical ideas and will complement
63 and develop the theoretical constructions of such concepts like “the learning region”,
64 “innovation environment” and “industrial districts”. Especially interesting in these cases seem
65 the countries undergoing the transformation of the economy, where there was brought the
66 destruction of many of the previously help cooperative compounds (networks of connections)
67 and indicated the inadequacy of popular assumptions, concepts and boundary conditions of

68 the economic development in the developed countries, what puts into question the meaning
69 of the direct transfer and application of new solutions to the ground of a country like Poland
70 [1].

71 Based on the presented theoretical solutions there was formed a hypothesis that the
72 phenomenon of competition in the regional dimension contributes to the acceleration of
73 innovation processes in Polish provinces.

74 The main objective of the conducted studies was the identification of the effect of the
75 distance from the nearest competitor on the innovation activity of the selected regional
76 industrial system in Poland.

77 Surveys were conducted in the years of 2007-11 on a group of 2 434 (the number of filled in
78 questionnaires) industrial companies in four selected, diverse provinces located in different
79 parts of the country – Masovian, Greater Poland, Silesian and Swietokrzyskie.
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81 **2. METHODOLOGY**

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83 The methodical side of analyses was based on the theory of probability – probit modelling.
84 When a dependent variable takes dichotomous values, the possibilities of using the popular
85 multiple regression, widely used for quantitative phenomena, are limited. The problem can
86 be solved by an alternative solution – the logistic regression [7]. Its advantage is that an
87 analysis and interpretation of results are similar to the classical regression method, hence
88 the methods of selecting variables and testing the hypotheses have a similar pattern. There
89 are, however, also differences, which include: more complex and time-consuming
90 calculations and production of the residual plots usually do not contribute significantly to the
91 model [11]. In a model where the dependent variable can equal either 0 or 1, the expected
92 value of the dependent variable may be interpreted as a conditional probability of an event at
93 given independent values.
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95 The forerunners in using the logistic curve were P.F. Verhulst and R.F. Pearl. A full model
96 was not used, however, until 1994 and 1953 by J. Berkson [3].
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98 In the methods with a dichotomous variable, the parameters are estimated according to the
99 maximum likelihood (ML) method. According to its rules, a vector of parameters is searched
100 for which gives the highest probability of arriving at the values observed in the sample (Welfe
101 1998). Generally, the application of the ML method requires formulation of a likelihood
102 function and finding its extreme value, which can be done in two ways: analytical and
103 numerical. Despite its complex procedure, the ML method has gained popularity since it can
104 be applied to a wide array of models, including models with variable parameters, complex
105 delay structure models, heteroscedastic models, and nonlinear models. The features of the
106 ML method, even for small samples, are in many cases much better than other alternative
107 estimators.
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109 The presentation and interpretation of the models was limited to their structural form. The
110 tables included only the models, including the parameters, satisfying the condition of the
111 statistical significance. The positive sign occurring by the main parameter indicates that the
112 probability of the occurrence of the given phenomena is statistically significantly higher in the
113 given group of companies than in the rest group of all subjects. The negative sign can be
114 interpreted as the opposite phenomenon. Probit modelling is an increasingly popular tool to
115 examine economic phenomena, and the results obtained this way constitute only a selected
116 fragment of the effects of studies conducted by the author in this area in all provinces in the
117 country.

3. RESULTS AND DISCUSSION

3.1 The Swietokrzyskie province

Given the frequency of the occurrence of models with statistically significant parameters in the Świętokrzyskie province, it can be stated that the distance from the nearest competitor quite often determines different areas of the technological activity in the region.

Table 1. The form of probit with the independent variable “distance from the competitor”, in models describing the innovation of the industry in the Swietokrzyskie province

Innovation attribute	Location of the nearest competitor	
	locally	in the country
Expenditures for the B+R activity	$-.39x-0,33$	-
Investments in the previously not used fixed assets	-	$+.65x+0,69$
Computer software	$-.43x+0,65$	$+.51x+0,33$
Implementation of new technological processes (including):	$-.43x+0,65$	-
a) by-production systems	$-.42x-0.32$	$+.37x-0.58$
Cooperation with competitors	-	$+.68x-2,01$
Cooperation with universities	-	$+1,31x-2,44$
Innovation cooperation in total	-	$+.42x-0,53$

* $P = .05$

If the competing subject is in the immediate vicinity (locally) then industrial companies less often show the tendency to implement innovation processes. This results from the problem of the system isolation of companies and the low level of their original innovation abilities – resulting in total from the low maturity of the market mechanisms. The observed phenomena concern several planes of the innovation activity (four models with statistically significant parameters). The discussed problems do not occur in a group of subjects, for which the competitor is located outside the region, but not outside the borders of the country. Unfortunately, there are not many units like that in the region (28,5%), nonetheless, they prove the necessity to maintain close contacts with subjects operating on the market, at least domestic, which actuates the flow of knowledge and gives access to its latest aspects, despite the need to overcome the distance barrier.

3.2 The Masovian province

Analysing the influence of spatial aspects on the innovation of companies it is worth to mention at the beginning that also in this case the geography plays a significant importance for the shape of innovation processes in the region. Given the frequency of the model occurrence with statistically important parameters it can be stated that the distance from the nearest competitor determines different areas of the technological activity.

156 **Table 2. The form of probit with the independent variable “distance from the**
 157 **competitor”, in models describing the innovation of the industry in the Masovian**
 158 **province**

Innovation attribute	Location of the nearest competitor	
	locally	in the country
Expenditures for the B+R activity	$-.54x-0.15$	$+.50x-0.50$
Computer software	$-.37x+0.46$	$+.30x+0.23$
Implementation of new products	$-.30x+0.52$	$+.31x+0.31$
Implementation of new technological processes (including):	$-.42x+0.65$	$+.32x+0.39$
a) manufacturing methods	$-.24x-0.05$	-
b) by-production systems	$-.42x-0.32$	$+.37x-0.58$
c) support systems	$-.31x-0.73$	-
Cooperation with PAN units	$-.71x-1.76$	-
Cooperation with national JBR	$-.37x-1.24$	-
Cooperation with foreign JBR	$-.85x-1.86$	$+.70x-2.34$
Cooperation with recipients	$-.33x-0.67$	$+.34x-0.89$
Innovation cooperation in total	$-.30x-0.05$	$+.32x-0.26$

159 * $P = .05$

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 161 If the competing entity is in the immediate vicinity, also locally, then industrial companies are
 162 less often characterized by the tendency to implement innovation processes. Although the
 163 presented case belongs to the group of the most developed provinces in Poland, we observe
 164 analogous dependencies regarding the Świętokrzyskie province connected with the system
 165 insulation of companies and the low level of their original innovation capacities. The
 166 observed mechanisms apply to all planes of the innovation activity (twelve models with
 167 statistically significant parameters), what proves that in the developed province the identified
 168 geographical dependencies occur even stronger. The discussed problems do not occur, as
 169 before, in the group of companies, for which the competitor is located outside the region, but
 170 not outside the borders of the country. Such entities are also a few in the region (23,4%),
 171 nonetheless, they prove the sufficient national aggregation to maintain the high dynamics of
 172 the knowledge flow, giving access to the latest technology, despite the imperative of the
 173 geographical barrier.

174 3.3 The Greater Poland province

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 176 In case of relations of the studies entities with competitive companies in the Greater Poland
 177 province there can be noticed two general conclusions. Distances from the competitor often
 178 influence the shaping of the innovation activity in the region. When the competitor is located
 179 further away – not locally, then the innovation activity of the industry in the Greater Poland
 180 province is higher. In this case the national level is critical – twelve models with positive
 181 signs by the statistically significant parameters. At the same time the foreign location of the
 182 competitor also has a positive influence in this region the shaping of the innovation activity of
 183 the analyzed companies. Differently than it was previously considered in two cases.

186 **Table 3. The form of probit with the independent variable “distance from the**
 187 **competitor”, in models describing the innovation of the industry in the Greater Poland**
 188 **province**

Innovation attribute	Location of the nearest competitor		
	locally	in the country	abroad
Expenditures for the B+R activity	$-.44x-0.23$	$+.53x-0.50$	$+.46x-0.38$
Investments in the previously not	-	$+.24x+0.59$	-

used (including):			
a) in buildings, premises and lands	-	-	+ .57x-0.73
b) in machines and technical devices	-	+ .21x+0.34	-
Computer software	-.20x+0.22	+ .21x+0.11	-
Implementation of new products	-.24x+0.46	+ .33x+0.30	+ .65x+0.36
Implementation of new technological processes (including):	-.40x+0.80	+ .32x+0.58	-
a) manufacturing methods	-	+ .21x-0.15	-
b) by-production systems	-.45x-0.29	-	-
c) support systems	-.36x-0.62	+ .37x-0.83	-
Cooperation with suppliers	-	-	+ .50x-0.74
Cooperation with PAN units	-	+ .89x-2.98	-
Cooperation with universities	-.48x-1.65	+ .80x-2.08	-
Cooperation with national JBR	-.84x-1.22	+ .66x-1.62	-
Cooperation with foreign JBR	-	-	+ 1.11x-2.12
Cooperation with recipients	-.21x-0.84	-	+ .61x-0.93
Innovation cooperation in total	-.29x-0.17	+ .29x-0.34	+ .69x-0.29

* $P = .05$

The short distance from the competitor (local) does not contribute to the acceleration of progress, quite the opposite. The opposite situation takes place for contacts in the country and abroad. This probably results from the fact of weakness of the inner industrial system characterised by high deficit of knowledge and resistance in its flow. This does not change the fact that even the regional level does not favour the implementation of the innovation activity. This dismisses the chances for the possibility to create clusters in the horizontal dimension.

3.4 The Silesian province

In the last considered province the distance from the nearest competitor also significantly determines the innovation activity within its borders. Just as before, also this time, the further the competitor is located from the studied company, the formation or implementation of new solutions takes place more often. The critical point is the boundary between the local territory and the others (including the region).

Table 4. The form of probit with the independent variable “distance from the competitor”, in models describing the innovation of the industry in the Silesian province

Innovation attribute	Location of the nearest competitor		
	locally	in the country	abroad
Expenditures for the B+R activity	-.56x+0.06	+ .57x-0.28	+ .51x-0.16
Investments in the previously not used (including):	-.26x+0.99	+ .32x+0.81	-
a) in machines and technical devices	-.25x+0.77	-	-
Computer software	-	-	+ .92x+0.63
Implementation of new technological processes (including):	-.29x+0.90	+ .36x+0.71	-
a) manufacturing methods	-.28x+0.23	+ .38x-0.04	-
b) by-production systems	-	+ .36x-0.49	-
c) support systems	-.41x-0.34	-	+ .47x-0.50
Cooperation with PAN units	-.76x-1.87	-	+ .97x-2.14

Cooperation with universities	-.56x-1.38	-	1.02x-1.63
Cooperation with national JBR	-.31x-1.02	+.31x-1.21	-
Cooperation with recipients	-.25x-0.58	-	+.74x-0.71
Innovation cooperation in total	-.21x+0.10	+.30x-0.05	+.60x-0.00

* $P = .05$

In other words, the unfavourable location is narrowed down to the nearest one, what means that the represented technological level and competition in the local grasp are weaker and do not favour the stimulation of the development of new products and technologies. Since the increase in the distance constitutes in the literature the limitation for the implementation of innovation processes, then the opposite results obtained in the study prove that the local dimension of competition is not sufficient to stimulate the innovation in the region. This, in turn, suggests the need to overcome the geographical barrier for the improvement of technological parameters of the offered products. While what is positive is the argument that the discussed difficulties have only the local nature.

Geography actively and strongly influences the involvement of the industry in the region into the innovation activity. The present economic potential of the province, similarly as in other considered cases, over the years from the perspective of horizontal section relations did not create the strong industrial system being able to compete on the external market (the lack of the element supporting the self-development), although in this case there can be observed symptoms of the improving situation.

4. CONCLUSION

[The aim of the conducted studies was the identification of the influence of the location of the nearest competitor on the innovation behaviours of companies in the selected regional industrial systems in Poland. For the analysis there were adopted four diverse in terms of location and economic level regions in the country – Masovian, Greater Poland, Silesian and Swietokrzyskie provinces.

Research conducted in the most developed countries show that the geographical proximity influences the acceleration of the technological progress and transfer of technologies between the companies. The spatial close-up in high-tech industries constitutes a significant support point for innovation systems located in such countries. However, in Poland we are dealing with the permanent and inherent lack of knowledge on the regional level, hence it is difficult to create innovation clusters self-sustaining development. On this basis there was created the scientific doubt whether we are dealing with similar mechanisms in the country classified as the group of “catching up” type of countries?

The obtained results of the analyses, based on the theory of probability, indicate that both the location and the current level of the economic development of the analysed provinces do not influence the diversity of the innovation activity of the regional industrial systems. Therefore, the discussed regularities in Poland have the system nature and are common for all provinces in the country.

Creating clusters in the horizontal grasp in Poland, taking into account the obtained results of studies, will be extremely difficult to achieve. The knowledge deficit and low own abilities create areas of local system technological gaps. The regional level in any case did not show significant statistical co-dependencies, what proves that this level of aggregation currently remains neutral for the implementation of the innovation activity. The geographical proximity in this grasp remains the factor stimulating innovation attitudes, but in highly developed countries, which do not include Poland. Perhaps at this stage of development more

255 significant for the national companies is the technological proximity independent of the
256 distance or the opposite proportional to it, i.e., the greater the distance from the nearest
257 competitor, the greater the occurrence of the technological closeness, resulting in the
258 acceleration of innovation processes in the domestic companies. Because only the national
259 location or the international one of the nearest competitor determines the transfer of
260 technology.

261 Companies in Poland are still at the stage of absorption of technology originally developed
262 outside the region's borders – in the country or abroad. Particularly unfavorable conditions
263 for the innovation activity occur in the regional industrial systems at the local level. On this
264 basis it can be concluded that as long as Poland is not in the group of the highly developed
265 countries (strong high-tech region), the theory of the “new economic geography” in terms of
266 studies conducted on the pages of this article will have a limited use.]

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