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Sales Range and Innovation Activity in the Industry System of Poland

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Abstract

Research background: In the literature, there is a discussion on the importance of the spatial distance to the user in the context of innovation activity. Although, most of this kind of studies concentrate on exporting enterprises and compare them to domestic ones. Exporting activity is very important for catching-up countries, because of technology transfer in its background.

Purpose of the article: The aim of this paper is to determine whether the innovative activity in Poland's industrial system is a consequence of close interactions (local and regional), or perhaps conditioned by the imperative of functioning on the national and international market? Main hypothesis was to claim that on the current development level of Poland, the relationship between the range of sales and innovation activities are different from those in the more developed countries.

Methodology/methods: Empirical studies were created in 2006-2012 as a result of the systematic collection of questionnaires filled by industry enterprises in Poland from all regions (5209 correct fulfilled questionnaires). Methodical analysis was based on the theory of probability - probit modeling, because dependent variables were binary (0 or 1).

Findings: Local and regional environment is not conducive to stimulating innovation activity, but national spatial is a sufficient space, but high intensity observed only when the company has been working on the international market. It means, that the industry maturity level in Poland is good enough for creating a domestic innovation environment. This kind of an aggregation level should be stimulating by the government innovation policy.

Keywords: *innovation, industry, system, country, sale range*

JEL Classification: *L52; O25; P51; O31, O32, O33*

Introduction

The model of the endogenous growth suggests that internationalization is an opportunity for businesses, mobilising them to innovation activity, particularly to the research and development intensity, and as a result to the growth of export (Romer, 1990, p. 75). At the same time, heterogeneity of companies concentrated in a limited geographical space (locally, regionally) has a negative impact on their opportunities for the investment expansion, improvement of productivity or development of export (Bernard (Ed.), 2003, p. 1269) – the advantage of specialisation over diversification. Specialisation according to the concept of endogenous development should contribute to an increased number of interactions (new specialised products and processes) only at the regional level, or even local, thus leading to the growing volume of internal transactions. This fact raises the question whether internationalisation proves to be a stronger phenomenon?

The first concepts discussing the process of internationalisation of enterprises were formed in the 70s of the last century, but since then they have evolved from the level of an incremental process (stage) towards the holistic, specified and integrated approach (Daszkiewicz, 2014, p. 9). Currently, the Upssala-I model is at the front of considerations (Johanson & Vahlne, 1977, p. 28; Johanson & Wiedersheim-Paul, 1975, p. 309) (U-model) as well as the updated U-model (Johanson & Vahlne, 2009, p. 1411; Schweizer, Vahlne & Johanson, 2010, p. 350),

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which draw attention to the important role, which is played by knowledge and education of companies as a result of the internationalisation process.

The theoretical background of the research

In the light of previous studies on the effects of diffusion of knowledge, undertaking and intensifying export contribute to the launch of mechanisms of the so-called technological learning through export (learning-by-exporting). It is also believed that the international expansion is a gradual process, where companies increase their technological level due to learning how to operate on foreign markets (Delgado, Farinas & Ruano, 2002, p. 60). In addition, exporters are exposed to a more intensive competition and are forced to a more frequent implementation of innovations than entities operating only on the local market – this also affects their productivity (Wagner, 2007, p. 78).

Although in the literature there is a discussion whether it is export that stimulates innovations, or the other way round, these phenomena are probably linked with a number of mutual interactions. Moreover, it is a phenomenon with a more heterogeneous nature, as there are innovative companies, which do not export and entities functioning on the international market, which do not introduce new technologies, as it depends on many circumstances. Research in this area was carried out in Spain in 1994-2005 and 2001-2008 obtaining different results. In the first one, it has been argued that the interactions are turning, while only R&D has a positive impact on export, and the other way round. At the same time, only the innovation processes have a significant impact on the export activity, while this one, in turn, only determines the product innovations (Filipescu (Ed.), 2013, pp. 30-31).

In the analyses carried out in Germany and in the European Union countries of the “old 15”, consistent results have been only partially achieved. It was shown that in the more developed countries, the intensity of export depends only on the innovative products, while it does not depend on innovative processes at all (Becker & Egger, 2013, p. 340). However, the attention at the same time is paid to the obtained conclusions, which are different than those achieved for research quoted previously, conducted in Spain.

Summing up these short theoretical considerations we conclude that these phenomena, even in the world research, did not gain full stability for the achieved results, and the research concepts are still evolving.

Therefore, on one hand, we are still dealing with theses that appeal for stimulating the export activities of enterprises, because it is significantly related to innovative activity, while on the other hand, new economic geography and the process of spatial approximation suggest that the companies, entering close geographical (local or regional) interactions, create innovative solutions, which ultimately lead to their export, at least outside the region. This does not change the fact that the end result of such a product system is obtained through the production, and mutual and multiple resale of intermediates in close spatial boundaries. As a result a regional product is formed, which is subject to export. The main research purpose appears in this situation: determination whether the innovative activity in the national system is the local or regional consequence, or whether it requires the over-regional or even over-national scope. On this basis a question appears: whether companies located in Poland behave differently than those functioning in much more developed countries – high technological gap?

The basic research hypothesis is formed as a statement that at the current level of development of Poland the relations between the range of sale and the innovation activity are different than the ones observed in more developed countries and only the structural changes in the economy and the acceleration of technological progress (reduction of the technological gap) will bring these trajectories closer together.

Research Methodology

The empirical layer of the research was created in 2006-2012, as a result of the systematic collection of questionnaires filled by industrial enterprises from various regions, completed by conducting appropriate econometric analyses on the developed database of primary data (5209 correctly completed questionnaires). Extension over time was due to the lack of research funding, despite multiple applications for such in various institutions in Poland.

The methodological part was based on probability, and more precisely on statistical modelling of the probit type. Its usefulness arises when the dependent variable takes two values only (0 or 1), meaning that the studied phenomenon takes place or not. Its use has already been repeatedly and successfully tested by various researchers in the country and abroad (Dzikowski, 2012, pp. 475-488; Tomaszewski, 2013, pp. 101-113).

Different levels of aggregation of the sale range have been adopted for independent variables: local, regional, national, international. The selection of variables in the study was based on methodological standards applicable in all OECD countries. According to them, the innovation activity is understood as the entrance (expenditures and their structures), exit (implementations in relation to the structure) and interactions with the environment (in a division into different institutions from the area of science and industry).

The mere interpretation of the obtained models was limited to the character standing next to the main parameter of the equation and the achieved probability values. Moreover, several basis statistics have been indicated related to the model and its parameter: standard error, Wald statistics, chi-square, p-model value (the limit value p was assumed for the analyses at the level of 0,05).

Local (close) environment and innovation activity

Innovation activity of the industrial system in Poland strongly depends on the scale of operations of enterprises within the meaning the sale range. From seventy-two potential models, only eight cases did not achieve the statistical significance. What is more, every time the directions of interaction are consistent within the considered independent variables, without raising any interpretative problems.

Table 1. Coefficient value by independent variable „local range”, in probit models describing innovation activity in the polish industry system (statistical significant models only)

Innovation activity	Coefficient	Standard error	Wald-statistic	Chi-square	P ₁	P ₂
Expenditures on R&D	-,684	0,055	-12,45	167,69	0,17	0,39
New investments (including):	-,380	0,049	-7,69	58,23	0,65	0,78
a) building and structures	-,381	0,056	-6,81	48,57	0,16	0,27
b) machinery and technical equipment	-,348	0,048	-7,26	52,35	0,57	0,70
Software solutions	-,589	0,048	-12,28	152,60	0,41	0,64
New products	-,320	0,048	-6,73	45,48	0,44	0,57
New technology (included):	-,565	0,048	-11,69	135,58	0,56	0,76
a) by-production systems	-,474	0,054	-8,86	82,40	0,19	0,35
b) support systems	-,534	0,060	-8,96	87,12	0,12	0,27
Cooperation with suppliers	-,303	0,054	-5,56	31,98	0,18	0,28

Cooperation with competitors	-,412	0,109	-3,77	16,71	0,02	0,05
Cooperation with customers	-,354	0,058	-6,07	38,74	0,14	0,23
Cooperation with PAN-units	-,400	0,164	-2,44	7,33	0,01	0,02
Cooperation with universities	-,380	0,105	-3,63	15,15	0,02	0,05
Cooperation with domestic R&D units	-,677	0,100	-6,82	59,86	0,02	0,09
Cooperation with foreign R&D units	-,821	0,230	-3,562	22,71	0,00	0,02
Total innovation cooperation	-,424	0,050	-8,555	74,84	0,30	0,46

P₁ – probability value of phenomenon in the purposeful group of enterprises

P₂ – probability value of phenomenon in the alternative group of enterprises

Source: the study based on own questionnaire research.

In the event when the company only operates on the local market, the chances to perform the innovation activity are statistically significantly lower than for the entities operating on a larger scale. It was impossible to estimate only one model for the dependent variable “new technologies directly related to production”. In the remaining seventeen cases, the interactions proved to be important when assuming a negative sign by the main parameter.

Summing up this part of the argument, we observe the system reluctance of companies limiting their activity to the local level, to show any innovation activity. Close geographical relations with customers in Poland do not create conditions conducive to entering into interactions of the technological nature. This is due to the current level of technological advancement of the country, weakness of local markets (no potentials), undemanding internal competition or the lack of pressure from the demand. Innovation activity at this level is primarily maintained through the relations with suppliers located outside the region and the passive transfer of knowledge. Given the current level of development of the local markets in Poland, it can be concluded that their development possibilities based on endogenous principles are unsatisfactory, taking into account the social mentality reluctant to change.

Space of the region and innovation activity

Since the local scope of impact proved to be unfavourable, perhaps the regional environment will also be conducive to innovation activity in Poland? Unfortunately, the boundaries of regions are also an inhibiting factor for the technological progress, however, with a slow change of some tendencies observed previously. In this situation, it has been possible to estimate fourteen out of eighteen models, which as statistically significant, which indicates the change of importance of the regional environment from the unfavourable impact towards a neutral direction. However, in other analyses cases, this level of aggregation is a de-stimulating factor for the innovation activity in the national industrial system, that is, the boundaries of provinces, in which the studied companies operate, so far have not created a friendly endogenous atmosphere for technological changes.

The boundaries of regions are the natural destimulant for innovation activity in the national industrial system, although the power of the negative impact is smaller than for the local sales range. Thus, endogenous intraregional relations cannot create circumstances conducive to technological changes in the provinces, and these are system-wide conditions, as they concern all regions in Poland. So far they have not achieved the internal potential able to spontaneously and systemically create innovations and accelerate processes related with them.

National environment and innovation activity

When analysing the patterns, which were observed for the companies with the national sales range, we can argue that the boundaries of the regions define the boundary between the low and high systemic innovation activity in Poland. Companies operating nationally are much more interested in implementing new technologies. Thus, the territory of the region is a measure of the technological inefficiency, as opening to a wider environment is conducive to accelerating the innovation activity, as evidenced by fifteen statistically significant models, in which the parameter has achieved a positive sign.

The national environment turns out to be a condition sufficient for raising the system chances for the innovation activity of industrial companies. In other words, the export activity is not a prerequisite for the acceleration of innovative processes in Poland. The supra-regional level is related to a higher level of competition, quality requirements, risk and necessity of the different organisation of the activity (increased distance). In total, they induce the break of the current thinking about the market, in order to be able to expand the sales and cross the demarcation line between the low and high productivity.

Export and innovation activity

The export activity of the companies is also closely linked with the innovation activity. Both the strength and universality of impacts are greater than in the case of the national sales range. As we can see, for the trends, the obtained results are consistent with analyses conducted in other countries, while being different in several interesting areas. From eighteen potential dependent variables, seventeen models were estimated (apart from the innovative cooperation with competitors). In all of them, the main parameters had a positive sign. Therefore, there is a positive and universal correlation between innovations and export. The achieved probabilities are naturally higher than for the national environment, that is the innovative intensity is higher in the group of experts.

Table 2. Coefficient value by independent variable „foreign range”, in probit models describing innovation activity in the polish industry system (statistical significant models only)

Innovation activity	Coefficient	Standard error	Wald-statistic	Chi-square	P1	P2
Expenditures on R&D	+0,617	0,039	15,66	246,46	0,53	0,29
New investments (including):	+0,365	0,045	8,12	68,09	0,83	0,73
a) building and structures	+0,448	0,041	10,98	119,79	0,36	0,21
b) machinery and technical equipment	+0,365	0,042	8,69	77,24	0,77	0,64
Software solutions	+0,540	0,041	13,07	176,16	0,75	0,55
New products	+0,123	0,039	3,14	9,96	0,58	0,54
New technology (included):	+0,451	0,044	10,14	106,85	0,83	0,69
a) production technology	+0,381	0,039	9,74	95,65	0,59	0,44
b) by-production systems	+0,428	0,040	10,82	116,7	0,44	0,28
b) support systems	+0,418	0,041	10,15	102,27	0,34	0,20
Cooperation with suppliers	+0,207	0,041	5,03	25,08	0,31	0,24
Cooperation with customers	+0,431	0,042	10,26	104,17	0,31	0,18
Cooperation with PAN-units	+0,215	0,092	2,34	5,33	0,02	0,01
Cooperation with universities	+0,477	0,063	7,56	55,97	0,08	0,03

Cooperation with domestic R&D units	+450	0,052	8,58	72,13	0,14	0,06
Cooperation with foreign R&D units	+709	0,085	8,32	71,83	0,05	0,01
Total innovation cooperation	+441	0,039	11,28	$\frac{127,9}{7}$	0,56	0,38

P₁ – probability value of phenomenon in the purposeful group of enterprises

P₂ – probability value of phenomenon in the alternative group of enterprises

Source: the study based on own questionnaire research.

The export activity favours the innovation activity. The international market is very demanding and forces more dynamic adjustment of the offer in the national companies, including in terms of the used technologies. The positive impact of export on the system nature, more common and stronger than of the companies restricting their sales market to the borders of the country.

Conclusions

The Polish industry is divided into two parts. The first of them is a group of companies operating in the province boundaries, offering the manufactured products locally or regionally (34,9% of the population). It is characterised by a much lower tendency to innovations in the areas of funding and implementing new technologies, as well as innovative cooperation with the sector and scientific community. These phenomena are common and strong, especially for the entities limited to the local market. On this basis, it can be stated that the national provinces have not reached the endogenous ability (potential) so far for generating new technologies. Therefore, the Bernard thesis is confirmed about the weakness of spatial approximation in stimulating innovative processes and the limited role of intraregional specialisation, that is small system chances for creation of cluster structures in these areas.

The second group of companies are those, which go with their products beyond the region. At the same time, for the increased innovation activity the sales on the national market is sufficient, as the export additionally makes these processes more dynamic (intensifies them) in all planes under consideration. This undermines Becker's thesis, which makes the export intensity dependent only in product innovations. Enterprises in Poland activate technological changes with the increase of the distance to the target market, which in turn increases the importance of the spatial approximation in the catching-up countries and the appropriateness or usefulness of the theory of the new Krugman economic geography.

From an evolutionary perspective, a stronger relation has been discovered between the export and new processes, when the national market remains a strong and necessary stimulant for the products, which is partly consistent with the conclusions drawn by Filipescu.

Taking into account other studies carried out in our country in this field it can be stated that the strong relation of export with innovation activity has been confirmed, but with different characteristics. As the chances for process innovations are higher than for product innovations, and in the case of the former, export additionally intensifies them, when its does not do this to the latter.

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