FUNCTIONING OF THE LOCAL PRODUCTION SYSTEMS IN BULGARIA, POLAND AND RUSSIA

THEORETICAL AND ECONOMIC POLICY ISSUES

WYDAWNICTWO
UNIWERSYTETU
ŁÓDZKIEGO

FUNCTIONING OF THE LOCAL PRODUCTION SYSTEMS IN BULGARIA, POLAND AND RUSSIA

THEORETICAL AND ECONOMIC POLICY ISSUES

Edited by
Aleksandra Nowakowska

WYDAWNICTWO
UNIWERSYTETU
ŁÓDZKIEGO

ŁÓDŹ 2015

Aleksandra Nowakowska – University of Łódź, Faculty of Economics and Sociology
Institute of Spatial Economics, Department of Regional Economy and Environment
90-214 Łódź, 36 Rewolucji 1905 St.

REVIEWER
Artur Ochojski

PUBLISHING EDITOR
Danuta Bąk

TYPESETTING
AGENT PR

COVER DESIGN
Stämpfli Polska Sp. z o.o.
Cover photo: © Shutterstock.com

Monograph financed under a contract of execution of the international scientific project within 7th Framework Programme of the European Union, co-financed by Polish Ministry of Science and Higher Education (title: "Functioning of the Local Production Systems in the Conditions of Economic Crisis (Comparative Analysis and Benchmarking for the EU and Beyond"))

Monografia sfinansowana w oparciu o umowę o wykonanie projektu międzynarodowego w ramach 7. Programu Ramowego UE, współfinansowanego ze środków Ministerstwa Nauki i Szkolnictwa Wyższego (tytuł projektu: „Funkcjonowanie lokalnych systemów produkcyjnych w warunkach kryzysu gospodarczego (analiza porównawcza i benchmarking w wybranych krajach UE oraz krajach trzecich"))

Published by Łódź University Press
First Edition. W.06758.14.0.K
Ark. wyd. 8,7; ark. druk. 11,125

ISBN 978-83-7969-488-4 (P)
ISBN 978-83-7969-489-1 (E)

Łódź University Press
90-131 Łódź, Lindleya no 8
www.wydawnictwo.uni.lodz.pl
e-mail: ksiegarnia@uni.lodz.pl
phone (42) 665 58 63, fax (42) 665 58 62

Print and setting: Quick Druk

CONTENTS

Edward Stawasz*

TRANSFER OF KNOWLEDGE AND TECHNOLOGY IN THE REGION OF LODZ

1. Introduction

For innovation activities to be effective, businesses need to get access to external sources of applied knowledge. It is important especially to smaller economic operators as their human, technical and financial resources are more limited. Among external sources of knowledge, regional science and research area, including universities, may be extremely useful. Knowledge transfer between universities and business, conditions of its effective and efficient course are currently the subject of vivid interest of science, politics and innovation management practice. It concerns research areas such as university entrepreneurship, regional innovation systems and open innovation models.[1]

Knowledge and technology transfer is an important element of regional innovation system because it impacts its efficiency and ability to meet the requirements of modern knowledge-based economy focused

* Associate Professor. Head of the Department of Entrepreneurship and Industrial Policy, Faculty of Management of the University of Lodz.

[1] L. Leydesdorff, M. Meyer, *The Triple Helix of university-industry-government relations*, "Scientometrics" 2003, Vol. 2; A. Nowakowska, *Regionalny wymiar procesów innowacji*, Publishing House of the University of Lodz, Lodz 2011.

on the improvement of innovation and competitiveness of the local economy and its individual actors.[2] It is important to adjust institutional solutions and practices in technology transfer to local economic and institutional specificity and to differentiated innovation needs of local businesses and the R&D sphere or innovation business environment. Thus, experience and the potential of regional technology transfer centres, their profile and networks of contacts decide on their quality and usefulness for regional innovation system.

The paper aims at describing and assessing practices involved in knowledge transfer between universities and business as well as institutional background of technology transfer on the example of the Lodz Region. The study uses results of own research and analyses and materials relating to the INNOPOLIS, RSI LORIS 2005−2013, RSI LORIS PLUS, BIOS, RSI LORIS 2030, Development Strategy of the Lodz Region, generally available statistical analyses and others.[3]

2. Knowledge transfer between universities and business in the region

Applied knowledge (innovative ideas) is at the grass roots of innovation. It is a precondition for innovation in business. Sources of innovation can be divided into internal (own), external and mixed.[4] Own resources

[2] E. Stawasz, *Transfer wiedzy w układzie uczelnie wyższe – przedsiębiorstwa w regionie łódzkim*, "Problemy Eksploatacji" 2012, Vol. 3; K. B. Matusiak, *Budowa powiązań nauki z biznesem w gospodarce opartej na wiedzy. Rola uniwersytetu w procesach innowacyjnych* [Building science and business cooperation in knowledge-based economy. Role of universities in innovation], Warsaw School of Economics Publishing House, Warsaw 2010.

[3] *Regionalna Strategia Innowacji Województwa Łódzkiego RSI LORIS 2005−2013*, LORIS, Lodz 2004; A. Rogut, B. Piasecki, *Regionalna Strategia Innowacji RSI LORIS PLUS*, Lodz 2008; *Strategia Rozwoju Województwa Łódzkiego 2020 – Projekt*, Board of the Lodz Region, Lodz 2012; *Szczegółowy opis osi priorytetowych Regionalnego Programu Operacyjnego Województwa Łódzkiego na lata 2007−2013*, Lodz 2011; *Regionalna Strategia Innowacji dla Województwa Łódzkiego LORIS 2030*, Lodz 2013; *Badanie potencjałów i specjalizacji polskich regionów. Województwo Łódzkie* (BPPWŁ), ROT of the Lodz Region, 2013.

[4] J. Bogdanienko, *Innowacyjność przedsiębiorstw*, Publishing House of the UMK, Torun 2004; I. Łącka, *Współpraca technologiczna polskich instytucji naukowych i badawczych z przedsiębiorstwami jako czynnik wzrostu polskiej gospodarki*, Publishing House of the Zachodniopomorskie University of Technology, Szczecin 2011.

include internal analyses of a company, staff creativity. For an innovation company the exclusive ownership of solutions is the main asset while high uncertainty of unwanted outcomes, long delivery period and high costs are disadvantages. External sources are studies conducted outside of the company, licences, takeovers, and *joint venture* companies. External technical thought is the simplest way of acquiring new solutions, effective and implying little risk, although it may make a business dependent on technology suppliers.

Transfer of external solutions can be described as *supplying market with technologies*.[5] It is a specific case of the communication process, often an interactive one, full of various feedback loops between the originators and recipients of knowledge.[6] It includes all sorts of solutions diffusion and technical education. Knowledge transfer entails the transfer of information necessary for one operator to replicate the work of another operator. Such information can take two forms: technical (engineering and scientific knowledge, standards) and procedural (e.g. legal, confidentiality agreements, patents, licences). In most cases it is a market process, where technology is purchased and sold. Knowledge transfer means a given portion of technical or organisational knowledge is transferred, together with *know-how* relating to it, for economic (commercial) purposes. Knowledge transfer can be commercial or non-commercial.[7] Non-commercial knowledge transfer includes, e.g.,: (1) knowledge transferred free of charge, studies, internships, etc. (2) professional associations, (3) mutual transfer of licences, (4) knowledge shared within companies, international holdings. Commercial transfer of knowledge is connected with knowledge and technology transfers between operators, who have no structural links and includes: (1) hard transfer, (2) licensing inventions, utility models and *know-how*, (3) information and the so called tacit knowledge.

---

[5] A. H. Jasiński, *Innowacje i transfer techniki w procesie transformacji*, Difin, Warsaw 2006.

[6] K. Santarek, J. Bagiński, A. Buczacki, D. Sobczyk, A. Szerenos, *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, Polish Agency for Enterprise Development, Warsaw 2008.

[7] Ch. Grimpe, H. Fier, *Informal university technology transfer: a comparison between the United States and Germany*, "Journal of Technology Transfer" 2010, Vol. 35, p. 637−650.

Knowledge is transferred mainly between science and research sector and business through a specific bridge linking the two worlds and bringing various economic, market, organisational, educational, etc. benefits to both parties. Partners in knowledge transfer, depending on the situation, are: R&D institutes, small and medium-sized enterprises, public institutions and private individuals. What is characteristic of science and industry collaboration (universities and business) is the variety of cultural and organisational arrangements in both spheres (different motivations, objectives and operational modes, results assessment criteria, etc.). It creates lots of difficulties in establishing relations and continuing efficient cooperation in knowledge transfer.

Knowledge transfer from the public sector of science and research to business takes place through numerous channels and organisational forms:[8]

– joint research and special targeted projects implemented in cooperation with businesses;
– research commissioned by companies,
– licences for various types of intellectual property, *know-how*,
– advice, opinions, expert opinions, reviews and scientific and technical dealings,
– technical staff exchange, training courses,
– spin-off businesses,
– scientific and popular publications, patent descriptions,
– conferences, seminars, fairs; training courses,
– informal scientists' contacts,
– staff mobility schemes (exchange/staff transfers from science to business and reverse), students' placements,
– information about new technologies, initiating transfers,
– support to innovative initiatives in SMEs,
– initiating cooperation networks,
– developing a system to support innovative undertakings and entrepreneurship.

[8] P. D'Este, P. Patel, *University – industry linkage In the UK: What are the factors underlying the variety of interactions with industry?*, "Research Policy" 2007, Vol. 36, p. 1295−1313.

Regional innovation policy plays an important role in knowledge transfer from the public R&D sector, universities included, to business. In functional terms, the policy provides a specific platform for cooperation of various organisations and institutions in the region, which have as their major (or one among many) objective the development of innovative entrepreneurship in the region. The list of such institutions includes: regional (provincial, county and local) authorities, regional development agencies, universities, R&D institutes, innovation centres, financial institutions, consulting companies, manufacturing and service businesses, etc. Within such a regional structure a specific network emerges linking all entities involved in innovation and technology transfer. Regional innovation policy is focused on demand aspect of innovation, where interactions among businesses, especially SMEs and science, research and technology are required. It results from the vicinity and more trust in partners originating from the same area, who subscribe to identical values identified by the same cultural factors.[9] Services for the transfer of knowledge and innovation within the system universities – local businesses are rendered mostly by regional institutions from innovative business environment, commercial providers active within the broadly understood area of entrepreneurship, innovation, technology transfer and commercialisation. Current state and development perspectives of this area of economy, the quality and scope of services have an increasingly bigger impact on the transfer of knowledge and innovation of individual companies and the economy as such.[10]

---

[9] A. Jewtuchowicz, *Terytorium i współczesne dylematy jego rozwoju*, Publishing House of the University of Lodz, Lodz 2005; A. Nowakowska, *Regionalny wymiar...*; S. Shane, *Government policies for encourage economic development through entrepreneurship: the case of technology transfer*, [in:] S. Shane (ed.), *Economic development through entrepreneurship. Government, university and business linkages*, Elgar, Cheltenham 2005.

[10] E. Stawasz, *Realizacja i integracja polityki innowacyjnej i przedsiębiorczości (wybrane problemy na przykładzie regionu łódzkiego)*, [in:] A. Nowakowska (ed.), *Budowanie zdolności innowacyjnych regionów*, Publishing House of the University of Lodz, Lodz 2009.

3. Analysis of science and business collaboration

3.1. Knowledge transfer between universities and businesses in the region of Lodz[11]

Speaking of how in practice knowledge is transferred between universities and business, we may distinguish seven patterns (see Fig. 1). They are dominated by simple, little advanced solutions. Placements within the framework of cooperation in training and education available to students, academic staff, employees from companies and other individuals are the most popular (40.5% of cases). They are followed by knowledge transfer between universities and businesses under research contracts (23.8%) and as a part of informal cooperation, i.e. placements, which take place without the consent of both interested parties (9.5%). Informal cooperation usually consists in free-of-charge use of university research infrastructure and results of studies without the consent of the university or in organising training courses in university facilities.

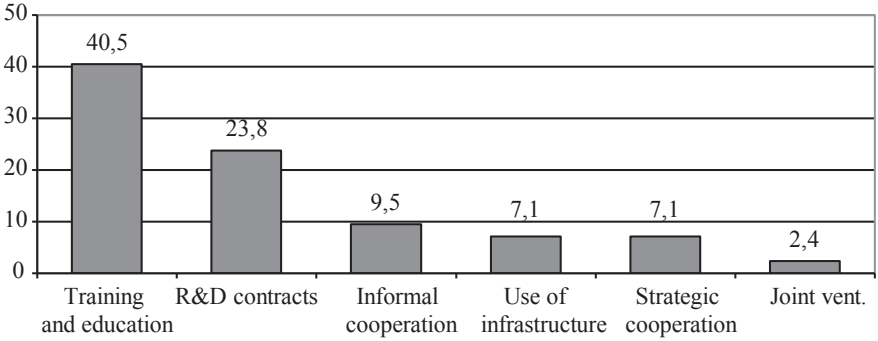

Figure 1. Types of knowledge transfer (percentage of all practices)

Source: own study

[11] In the paper we used results of empirical studies conducted in the period 2010−2011 within the framework of an international project "Innovation Policy in University City Regions – INNOPOLIS" (INTERREG IVC Programme) delivered with the involvement of the Author by the University of Lodz.

Other types of science – business knowledge transfer are much more rare. We may list here knowledge transfer as a part of the use of infrastructure (7.1% of cases) or as a part of strategic cooperation between universities and businesses (only three cases – 7.1%). There was only one case of knowledge transfer from a university to business, which took the form of a joint venture, which is considered a very advanced type of knowledge transfer.

Practical knowledge transfer between universities and business in the Lodz Region was initiated in top-down arrangements within the framework of the innovation policy in the region either by the universities or by businesses themselves. The analysis of how knowledge transfer is initiated in the Lodz Region shows that the impulse, first and foremost, comes from universities (67.6% of cases), mainly under various economic cooperation programmes. Every sixth case (18.9%) was initiated by businesses and every seventh resulted from innovation programmes in the regions (13.5%). Among 7 cases initiated by business there are four, which fall under contract-based (research) cooperation and three cases of informal cooperation. In turn, among 5 cases initiated under innovation schemes, there are four based on research contracts and one case of training and education type.

Knowledge transfer practices between universities and business in the Lodz Region were analysed in terms of their duration and reproducibility (under different circumstances and in different institutions). When it comes to the duration, two groups of practices were distinguished: long-term (over 6 months) and short-term (less than 6 months) ones. The analysis shows that short-term practices dominate – 4/5th of all cases. Longer lasting practices, i.e. the most useful for knowledge transfer, account for only 1/5th of all cases. All of these cases consider knowledge transfer between universities and business within the framework of contracts or long-term strategic cooperation.

More than 4/5th of all cases (82.6%) are reproducible, meaning they can apply to different circumstances and different operators. Hence they can be disseminated in the Lodz Region as the so called “best practices”. Only 17.4% of cases were irreproducible and hard to disseminate. These were mainly the cases of knowledge transfer between universities and businesses under informal cooperation.

There are two types of scope of knowledge transfer between universities and business, i.e. direct cooperation between the two parties and cooperation, in which third party, e.g. local offices, other stakeholders, are involved. The first type, when knowledge transfer takes place between universities and business, dominates (77.1% of cases). More parties have been reported in only 22.9% of cases. Half of them were covered by contracts.

In terms of the impact of analysed practices of knowledge transfer between universities and business, we distinguished direct effects consisting in knowledge transfer and indirect effects, which help initiate knowledge transfer. Analysis of how knowledge is transferred from universities to business in the region suggests that indirect effects dominate (62.9% of cases). Direct knowledge transfer was reported in a bit more than 1/3rd of cases. That illustrates the weakness of knowledge transfer between universities and business in the region. Only every third case of cooperation resulted in direct transfer of knowledge. These were the cases of contract-based cooperation, informal cooperation and strategic cooperation, i.e. long-term arrangements. The remaining 2/3rd are cases of potential knowledge transfer as they just initiate the process.

The analysis also demonstrates that practices around knowledge transfer between universities and business in the Lodz Region entail little risk of failure, that is true of almost 70% of analysed types, for which no or minimum risk of failure was found out. Only 30% of analysed practices were bearing medium risk of failure. Noticeable risk of failure appears usually in the following cases:

– cooperation with the engagement of a third party, e.g., a business environment or technology transfer organisation, government agencies (80% of such cases),

– cooperation initiated top-down (formally), where both sides, i.e. the university and the company are sort of „forced" into knowledge transfer (60% of cases),

– cooperation under research contracts, usually entailing high risk of failure.

University – business knowledge transfer allows both parties achieve a series of scientific, research, educational, economic, organisational and market benefits. Businesses benefited relatively more (97%) than universities (88%).

Both sides of knowledge transfer pointed to different benefits:

1. For businesses the benefits were:

a) scientific and research, connected with the acquisition of new or improved knowledge for the company (43% of businesses); we must note that acquired knowledge in the majority of cases was implemented in practice (60% of such businesses), which confirms high practical value of knowledge transfer,

b) organisational, connected with developing the skills of employees and improving operational strategy (34% of businesses),

c) economic, connected with improved economic performance, e.g., reduction of the cost of production, charges for services (23% of businesses),

d) market oriented, connected with commercialisation of knowledge and improved market position of a company (6% of companies).

2. For universities the benefits were:

a) economic, income for their services (43% of universities),

b) educational, relating mainly to the possibility of finding placements for students (43% of universities),

c) scientific and research, connected with the development of knowledge in cooperation with business, e.g., testing and laboratory tests of technology in companies (20% of businesses),

d) organisational, connected with the development of scientific staff (9% of companies),

e) market, relating to the commercialisation of knowledge originating from the university (6% of universities).

The above overview of benefits indicates that businesses focused on scientific, research and organisational benefits, while universities on economic and educational advantages.

3.2. Innovative business environment organisations

Local and regional organisations, which support their beneficiaries, referred to as *innovation and entrepreneurship centres* (abbr. IEC) are an important link in contemporary systems of technology transfer in Poland.[12]

[12] A. Bąkowski, M. Marzewska (eds.), *Ośrodki innowacji i przedsiębiorczości w Polsce. Raport 2012*, Polish Agency for Enterprise Development, Warsaw 2012.

Innovation centres promote and incubate innovative entrepreneurship, technology transfer and deliver pro-innovation services, mobilise entrepreneurship of academic community and encourage to science and business collaboration. This group of support centres includes: technology transfer centres, university business incubators, technology incubators, e-incubators, technology, science, research, industrial and technology parks, and technopoles.

Since the beginning of systemic transformation in 1990, the number of innovation and entrepreneurship centres in Poland grew systematically (with the exception of the period 1998−2000) to arrive at 821 active centres in 2012, including: 40 technology parks and 14 park-based initiatives, 29 technology incubators, 73 pre-incubators and academic entrepreneurship incubators, 58 incubators of entrepreneurship, 69 technology transfer centres, 68 seed capital funds, 10 networks of business angels, 86 local and regional borrowing funds, 55 credit guarantee funds, 319 training, advisory and information centres. The number of innovation centres was 280, meaning 34.2% of the total population of innovation and entrepreneurship centres. EU membership and access to structural funds particularly mobilised the development of support organisations. The biggest increase was recorded in the category of technology parks as well as seed capital funds, pre-incubators and incubators of technology. It is indicative of considerable saturation of the Polish economy with IEC centres.[13]

The IEC network, which supports the innovation of regional economy and technology transfer in the Lodz Region, is well developed in quantitative terms.[14] In 2012 in the region there were forty eight innovation and entrepreneurship centres, including sixteen innovation centres. These are foundations, commercial law companies, associations and other. They operate on *non profit* basis or commercially.

Specialist services offered as a support to innovation and technology transfer in the Lodz Region include:

– assistance in establishing innovation start-ups,
– advice and training for SMEs,
– economic promotion of concrete industries or sectors at regional level,

[13] *Ibidem*.

[14] The paper uses results from expert opinion by E. Stawasz, P. Głodek, *Przygotowanie modelu transferu technologii w regionie łódzkim*, University of Lodz, Lodz 2012.

– matching partners: science–business,

– technology transfer and commercialisation, technological and patent advice,

– assistance in financing economic undertakings, access to European funds.

When analysing the availability of the services of such centres we compared the number of inhabitants and the number of companies in the region with the number of centres. On average, there is one centre of any type per 52.8K inhabitants and 4,761 companies, which is a bit below national average. The share of innovation centres in the total population of innovation and entrepreneurship centres was 33.3% (below national average) in 2012. There was one innovation centre per 14.3K companies (14.2K for the country).

The overview of activities of organisations, which support technology transfer and innovation in the region shows that most of them focus mainly on the promotion of innovation, advisory services and information to businesses, less on financial support to innovation start-ups. That is indicative of mostly "soft" nature of regional support system to technology transfer as these organisation concentrate on promotion, information and intermediary services in seeking financial support. Services in technology transfer vary depending on the type of the centre.

In technology parks services in technology transfer relate first of all to matters pertaining to the protection of intellectual property rights for companies, advisory assistance in technology implementation and intermediary services in contacts with technology originator or recipient and, the least, in technology evaluation on order of business sector. Technology incubators offer incubation services and access to EU funds; they fill in business space with sound commercial businesses. Similar services are offered by pre-incubators and academic incubators of entrepreneurship, which, on top of that, offer training courses. Technology transfer issues occupy little prominent places on their priority lists. Technology transfer centres identify the following objectives of their activity: commercialisation and technology transfer (technology transfer to economy, commercialisation of results of research, contacts with business people to promote technology transfer, the development of academic system of technology transfer) and managing intellectual property (protection of research results, making patent rights available, licence and implementation agreements).

Strong concentration of regional infrastructure of innovative business environment in the Lodz agglomeration (16 out of 10 centres operate in Lodz agglomeration) is its weakness as innovation centres are missing in towns with some academic and industrial potential (Skierniewice, Piotrkow Trybunalski, Radomsko and Sieradz). There is also too much competition among these institutions and a very individualistic approach. The scale of activities is too small, organisational and financial foundations too weak, experience in technology transfer not sufficient, poor contacts with academic and business environment and international links. In particular the staff potential, experience and profile of university technology transfer centres do not match the potential of universities they work for. Attention should be paid to the potential and scope of activities of the Lodz Regional Science and Technology Park in Lodz which have been increasing since 2012 making it the leader of the technology transfer system in the Lodz Region.

Activities of regional IEC are little coordinated, especially in the area of technology transfer and entrepreneurship and support to innovative undertakings. Innovation has not got enough support in regional innovation and entrepreneurship policy. As a result, there are insufficient instruments for building an area of research, innovation and technology transfer in the region, developing the so called innovative entrepreneurship environment or effective support for modern labour resources (human capital) and knowledge transfer mechanisms.

4. Conditions for technology commercialisation and transfer in the region

The development of technology transfer in the Lodz Region is shaped by two categories of factors, which act in opposite directions and can be identified as:

1. *Driving forces* – which positively impact transfer and commercialisation processes. They can be treated as opportunities and new possibilities that generate foundations of knowledge-based economy.

2. *Barriers* – all restrictions and disturbances to smooth operations of the system of transfer and commercialisation, which block cooperation between scientific institutions and business and innovative entrepreneurship.

Both of the above categories of factors can be put in order in four the following areas: (i) *structure* – objective changes in the environment, new structures and institutions, which create foundations of knowledge-based economy, (ii) *system* – characteristics resulting from binding legislation, regulations and innovation and entrepreneurship policies, (iii) *awareness and culture* – dissemination of knowledge on processes, their understanding and approval, (iv) *competence* – capabilities and efficiency of the participants of the system in delivering and managing innovation.

The key problem of building an efficient technology transfer system consists in eliminating barriers, which hamper its effective operations and development in the region:

1. *Structural barriers* – connected first and foremost with the specificity of the sectors of economy, science, R&D and support offered by the Lodz Region. They also arise from the absence of strategies or policies leading to, e.g., inappropriate allocation of the EU funds, low competences of public administration or poorly developed regional growth poles. The major identified structural barriers in the regional technology transfer system are: excessive red tape and formality of support mechanisms funded by the EU, favouring technical infrastructure at the cost of entrepreneurship and technology transfer services, poor consolidation of the technology transfer system, immature market of new business ideas, lack of local demand for innovative products, universities oriented at the development of little practical education services.

2. *Awareness and culture-related barriers* – relate to the lack of trust or stereotypes. They result from the lack of awareness and little approval for innovative attitudes. The group includes barriers such as: low intensity of contacts and cooperation between business community and scientific institutes (often these contacts are informal), little involvement of scientific institutions into the development of innovative solutions that they could offer and lack of commercialisation initiatives.

3. *Systemic barriers* – connected with over-regulation, too many legal acts and frequent changes in legislation. This category includes barriers, such as: lack of common visions, how regional innovation policy could

translate into social and economic development, regulations concerning the protection of intellectual property rights make it difficult to generate benefits from future commercialisation.

4. *Competence barriers* – refer to public administration, local authorities and administration, universities, business people as well as the staff and management boards of supporting institutions. These barriers may be connected with State aid, various aspects of intellectual property, available pro-innovative services and the development of the part of financial market dedicated to support innovations, which often go far beyond competences of people dealing with such broad subject.

When it comes to the *driving forces* of technology transfer system in the Lodz Region, their role seems to be not more than moderate in stimulating the development of the system. Relatively the best is the situation of competence factors, however, they play little visible role in the development of regional technology transfer system. Against this background, relatively good assessments were given to structural and systemic factors. The lowest scores were given to awareness and culture-related factors. In this last case it is clear that social awareness, policy, economy and their impact on technology transfer in the region are lagging behind the most.

Among *structural factors,* the most important are EU funds, which create new possibilities of financing undertakings leading to economic growth, including the development of entrepreneurship, innovation, technology transfer, technology centres development, developing pro-innovation services, education, training, etc., systemic changes, development of entrepreneurship, FDI inflow and Poland's EU accession intensified competitive pressure in regional economy and substantially altered operating conditions for local businesses by stressing the need of innovative behaviour, resetting local business to new growth factors connected with the state-of-the-art technology, higher know-how expenditure and the development of human resources as extensive growth possibilities have almost reached their limits.

In the group of *systemic* factors, the development of *venture capital* market institutions, in particular in its the weakest link connected with investing in innovative businesses at early development stages (*seed* and *start-up*), has got some importance.

Among *awareness and culture-related* factors support to academic entrepreneurship is relatively important as it gives hope to overcoming common belief that commercial tests go against the principles of R&D works and, as such, are improper for the representatives of science. Universities, through their staff, relatively often get involved in support programmes and in the management thereof. Managers of innovation centres are present or past university employees.

Among *competence* factors, internationalisation of the activities of innovation centres and share in international projects improve the knowledge about models, processes and strategies connected with know-how and technology transfer, build up skills in moving around on international markets, improve experience and competence of managers and owners of Polish companies in product development policy, marketing, financial and knowledge management.

The overall assessment of the driving forces and barriers in the system of technology transfer in the Lodz Region suggests that the barriers are stronger than driving forces, which develop the system. It means there are serious difficulties in the functioning of the transfer system in the region. Driving forces are still too weak to give a significant impulse for its development.

Barriers are stronger than the driving forces in all analysed areas of the technology transfer system. This is the sign of difficulties in all areas of the system with sending development impulses. Relatively the biggest problems are connected with structural and awareness and culture-related factors. The smallest obstacles were observed for competence and systemic factors.

5. Conclusions

The analysis of knowledge transfer practices between universities and businesses in the Lodz Region shows that simple, little advanced practices prevail, which are initiated mostly by the universities under various regional economy collaboration programmes. They usually relate to short-term cooperation in training and education. In most cases they are reproducible, meaning, they can be used in different circumstances and by different entities. Hence, they can be disseminated in the region of Lodz as the so called. „best practices". Dominant format of cooperation implies knowledge transfer between universities

and business. The outcomes are mainly indirect and remain at the beginning of knowledge transfer process. That is indicative of the weakness of knowledge transfer between universities and businesses in the Lodz Region.

Strong concentration of regional infrastructure of innovative business environment in the Lodz agglomeration is its weakness as well as too much competition among these institutions and a very individualistic approach. The scale of activities is too small, organisational and financial foundations too weak, experience in technology transfer not sufficient, poor contacts with academic and business environment and international links. In particular the staff potential, experience and profile of university technology transfer centres do not match the potential of universities they work for. Activities of regional IEC are little coordinated, especially in the area of technology transfer and entrepreneurship and support to innovative undertakings. Innovation has not got enough support in regional innovation and entrepreneurship policy, which translates into insufficient support for knowledge transfer mechanism.

The above presented analysis of conditions connected with observed driving forces and barriers in the system of technology transfer and commercialisation in the Lodz Region shows that barriers in technology transfer and commercialisation are much more powerful than factors identified as driving forces. That is true of all areas of the system. It means there are substantial difficulties in the functioning and development of the technology transfer and commercialisation system in the region. Driving forces are still too weak to provide sufficient impulse to the development of the system. Relatively the biggest obstacles are observed with respect to structure, awareness and culture. The smallest obstacles are experienced in the area of competences and system.

Bibliography

Badanie potencjałów i specjalizacji polskich regionów. Województwo Łódzkie (BPPWŁ) (2013), Regionalne Obserwatorium Terytorialne Województwa Łódzkiego.

Bąkowski A., Marzewska M. (eds.) (2012), *Ośrodki innowacji i przedsiębiorczości w Polsce. Raport 2012*, Polish Agency for Enterprise Development, Warsaw.

Bogdanienko J. (2004), *Innowacyjność przedsiębiorstw*, Publishing House of the UMK, Torun.

D'Este P., Patel P. (2007), *University – industry linkage In the UK: What are the factors underlying the variety of interactions with industry?*, "Research Policy", Vol. 36, p. 1295−1313.

Grimpe Ch., Fier H. (2010), *Informal university technology transfer: a comparison between the United States and Germany*, "Journal of Technology Transfer", Vol. 35, p. 37−650.

Jasiński A. H. (2006), *Innowacje i transfer techniki w procesie transformacji*, Difin, Warsaw.

Jewtuchowicz A. (2005), *Terytorium i współczesne dylematy jego rozwoju*, Publishing House of the University of Lodz, Lodz.

Leydesdorff L., Meyer M. (2003), *The Triple Helix of university-industry-government relations*, "Scientometrics", Vol. 2.

Łącka I. (2011), *Współpraca technologiczna polskich instytucji naukowych i badawczych z przedsiębiorstwami jako czynnik wzrostu polskiej gospodarki*, Publishing House of the Zachodniopomorskie University of Technology, Szczecin.

Matusiak K. B. (2010), *Budowa powiązań nauki z biznesem w gospodarce opartej na wiedzy. Rola uniwersytetu w procesach innowacyjnych*, Publisher of the Warsaw School of Economics, Warsaw.

Matusiak K., Guliński J. (eds.) (2010), *Rekomendacje zmian w polskim systemie transferu technologii i komercjalizacji wiedzy*, Polish Agency for Enterprise Development, Warsaw.

Nowakowska A. (2011), *Regionalny wymiar procesów innowacji*, Publishing House of the University of Lodz, Lodz.

Lundstrom A., Almerud M., Stevenson L. (eds.) (2008), *Analysing measures in European Countries*, IPREG, Stockholm.

Regionalna Strategia Innowacji Województwa Łódzkiego RSI LORIS 2005−2013 (2004), LORIS, Lodz.

Regionalna Strategia Innowacji dla Województwa Łódzkiego LORIS 2030 (2013), Lodz.

Rogut A., Piasecki B. (2008), *Regionalna Strategia Innowacji RSI LORIS PLUS*, LORIS PLUS, Lodz.

Santarek K., Bagiński J., Buczacki A., Sobczyk D., Szerenos A. (2008), *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, Polish Agency for Enterprise Development, Warsaw.

Schartinger D., Schibany A., Gassler H. (2001), *Interactive relations between universities and firms: empirical evidence from Austria*, "Journal of Technology Transfer", Vol. 26.

Stawasz E. (2009), *Realizacja i integracja polityki innowacyjnej i przedsiębiorczości (wybrane problemy na przykładzie regionu łódzkiego)*, [in:] Nowakowska A. (ed.), *Budowanie zdolności innowacyjnych regionów*, Publishing House of the University of Lodz, Lodz.

Stawasz E. (2012), *Transfer wiedzy w układzie uczelnie wyższe – przedsiębiorstwa w regionie łódzkim*, "Problemy Eksploatacji", Vol. 3.

Stawasz E., Głodek P. (2012), *Przygotowanie modelu transferu technologii w regionie łódzkim* (copied printout), University of Lodz, Lodz.
Strategia Rozwoju Województwa Łódzkiego 2020 – Projekt (2012), Board of the Lodz Region, Lodz.
Szczegółowy opis osi priorytetowych Regionalnego Programu Operacyjnego Województwa Łódzkiego na lata 2007−2013 (2011), Lodz.

Abstract

The paper presents the current status of business and university collaboration in knowledge transfer and the institutional aspect of technology transfer system on the example of the Lodz Region. It outlines the practices of knowledge transfer between universities and industry, including the effects and benefits of knowledge transfer for both cooperating parties. Second part of the paper is the description of regional infrastructure of innovation environment and the third one explains the conditions (driving forces and barriers) of technology transfer and commercialisation in the Lodz Region.

Key words: innovation, knowledge transfer, university-business cooperation, institutions, region of Lodz.