

THE IMPACT OF TECHNOLOGY TRANSFER ON INNOVATION

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Abstract: The aim of this paper is to examine the two types of relationships – the first one between R&D activities of the firms and innovations and the second relationship between technology transfer and innovation among businesses in Azerbaijan. Data collection were conducted through surveys among 300 small and medium businesses operating in different sectors of economy in Azerbaijan. The novelty of the research lies in 1) surveying the SME sector which have less intensive innovation activities than large, capital intensive firms; 2) SMEs owned entirely by foreign investors are more innovative as compared to firms owned by local investors. Developed and developing economies have attached significant importance to technology transfer as a catalyst of innovation. Transfer of knowledge and technology from generators of such technology including universities and research institutions to industry has shown its result in the example of countries where there is a strong bridge between universities and industry. In other economies where there is not such a strong link between industry and research institutions, innovation can be promoted through adopting ready technology developed by universities and businesses abroad. The results of econometric analysis indicate that while a strong relationship exists between R&D investment and innovation, there is not a strong empirical support that obtaining licenses will increase innovation potential of firms. The partnership between firms and research centers as well as universities, on the other hand lead to increased innovativeness of the businesses under study.

Key words: Business, innovation, innovation potential, R&D, technology transfer, university, Azerbaijan

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Introduction

Businesses can increase their competitive edge by building know-how and innovation potential through technology transfer, which refers to procurement of technology developed by universities or businesses within or across national boundaries. OECD defines innovation as the implementation of a new or a

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significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations of a company (OECD report, 1981). G. Lundquist defines technology transfer as the movement of a set of capabilities, since the usage of technology transfer after acquisition creates capability (Lundquist, 2003). Twiss defines technology transfer as the act of buying other companies' R&D for its profits and advantages (Twiss, 1986).

Technology transfer helps companies to build capabilities and improve business performance because technology transfer brings inimitable knowledge that is only exclusive to the company to which it is transferred. Technology transfer requires an intensive knowledge transfer inside the organization, which may be managed by different methods (Slocinska and Depta, 2015). Outsourcing and technology transfer provide firms with the platform for developing capability to achieve superior performance in the marketplace (Appiah-Adu et al., 2016) and the communication and information flow inside and between firms may be improved (Turek and Dunay, 2014; Kopishynska et al., 2016). Foster differentiates between horizontal and vertical technology transfer (Foster, 1962). Horizontal technology transfer refers to the transfer of technological knowledge or innovation between projects, organizations, industries and nations, whereas vertical technology transfer refers to the transfer of technological knowledge or innovation from basic to advanced research, for development through commercialization. The reasons for acquiring technology from others include the need for target technology; it is an easier way to enter a specific market compared to self-R&D or imitation, the reduction of R&D periods, and the use of patents with no risk (Park and Lee, 2011). The lack of R&D investments on operating performance is affected by the interactions between business type and industry value chain (Wang and Wu, 2012). Emerging economies in the post-soviet region view economic growth based on innovation as an important condition of ensuring sustainable growth in the 21st century. In light of this, governments of developing economies have adopted state programs on stimulating innovation among small and medium businesses. The Development Concept of Azerbaijan Republic approved by the President in 2012, "Azerbaijan 2020: Look into the Future" emphasizes the establishment of market infrastructure network that serves to develop the non-oil sector (Azerbaijan-2020: Look into the Future, 2012). Over the past decade, the economic growth of Azerbaijan was mainly due to natural resources, which account for over half of its budget revenues (Aliyev and Gasimov, 2018). GDP and more than 90 percent of its exports (Hasanov, 2013). The research of Svarc and Dabic (2019) pointed out that technology transfer should be coupled with nationally concerned actions on overall economic and political reforms in order to gain efficient results.

According to findings of a study conducted by the World Bank in 2013, only 12 percent of businesses in Azerbaijan that participated in the study indicated that they have introduced new or substantially improved product or service in the past three

years (Kuriakose, 2013). This shows a need for a system which encourages more innovative activity among small and medium businesses. Traditional entrepreneurialism lacks the innovation dimension and previously it threatened technological progress and economic growth in the long run (Block et al., 2013). Thus, the exploitation of new knowledge within the knowledge-driven entrepreneurial economy is a main issue of contemporary organizations (Audretsch and Link 2018), individual entrepreneurs are also put into the center of the innovation system (Acs et al., 2017). Not only large companies and innovation driven enterprises should be concerned in innovation, but also traditional small and medium enterprises (Acs et al. 2014). In general, Industry 4.0 process may contribute to expectations on the future performance by implementing new technologies, which provide the background for development (Dalenogarea et al., 2018).

This paper presents arguments proposed by several researchers that theoretically highlight how technology transfer can create capability and impact on business performance. It builds on the previous research on the importance of technology transfer for the competitiveness at a firm level. The authors conducted an analysis of the level of innovation among Azerbaijani businesses. The rest of the paper proceeds as following: section two is on literature review and the third section discusses the data analysis. Results of the analysis are presented in section four, conclusions are given at the end of the paper.

Literature Review

Technology transfer is an important force behind developing technological capabilities as it is now being recognized as having played an important part in the industrial development of most developing economies in the 21st century. Some researchers defined technology transfer from a broader perspective as the movement of knowledge, skill, organization, values and capital from the point of generation to the site of adaptation and application. Mansfield (1975) classified technology transfer into vertical and horizontal; explaining that vertical relates to transfer of technology from basic research to applied research to development and then to production respectively while horizontal deals with the movement and use of technology applied in one place, organization, context, to another place, organization and context.

Technology transfer from developed to underdeveloped countries (often referred as North–South technology transfer) started to attract researchers in 1990s. Acs and Preston (1997) highlighted the role of exports and foreign direct investment as main channels through multinational firms for technology transfer and globalization. Currently, the focus of technology transfer is on the exploitation of comparative advantages within global competition rather than the acceleration of economic development underdeveloped nations (Audretsch et.al, 2014).

Another driver of entrepreneurial discovery and exploitation is access to information. Firms with access to information have better innovation performance and employment of appropriate technology. Companies get the information necessary for innovation-related activities from their R&D departments, customers and particularly universities and public research organizations (Fiet and Patel 2008; Link et al. 2008).

Lizinska et al. (2014) highlighted the importance of the institutional background (i.e. different business environment institutions) in relation with direct foreign investment. According to their results the regional and local development agencies, chambers, training and advisory institutions are those organizations that might help to raise growth potential of local businesses by increasing their knowledge and skills, providing proper incentives to attract new investors. Some researchers also studied the role of informal university technology transfer (Grimpe and Fier 2010), and the role of incubators, coaches and financial intermediaries within the technology transfer process (Colombo et al. 2010). Informal technology transfer may be especially significant for developing countries with underdeveloped infrastructures in order to develop less capital-intensive technology like expensive laboratories and equipment (Audretsch et.al, 2014).

Technology transfer helps the developing countries to improve their trading terms and may result in a decrease in welfare of workers in developed nations (Krugman, 1979).

The relevance of technology transfer to firm operations in the context of developing countries has been proven to result in improved knowledge; value-added processes through technology adoption, and enhanced competitive advantage for business performance (Liao and Hu, 2007). Evidence from the early and late industrializers shows that innovation performance of a firm has got various drivers. After analyzing Chinese innovative firms Zhang and Tang (2017) concluded that collaboration breadth of employees positively affects the innovation performance of firms, while technological heterogeneity among employees positively moderates the relationship between collaboration breadth and innovation performance. In another study among Japanese firms, Kwon and Park (2018) revealed that firms that are mainly owned by another firm are not as active in R&D as independent firms and R&D activities are significantly and positively related with foreign ownership if the parent firm is not from a G7 country.

Enterprises acting entrepreneurially (within the context of a network of competitors, suppliers and customers) have been the major players in developing technological capabilities and competitiveness. The sophisticated consumer demands and rapid change in technology requires firms to have some inimitable structures and practices that will protect it from the unpredictable macro and micro-environmental factors. Technology transfer in the short term offers a company, especially local firms, lower costs or better and improved products and develops capability which feeds into a sustainable competitive advantage in the longer term

depending on the effectiveness of the application of the acquired technology. Thus, the role and impact and contribution of technology transfer cannot be underestimated.

According to the World Bank report, the level of technology transfer among businesses in Azerbaijan needs to be improved (Kuriakose, 2013). This report analyzed four types of innovative activities in Azerbaijan: introducing new products and services (product innovation), upgrading an existing product or service (process innovation), investment in research and development (R&D), and licensing technology from a foreign owned company. According to findings of the report, while nearly 70 percent of the businesses analyzed in the report have undertaken process innovation, the rate of product innovation was significantly lower. The number of businesses that invested in R&D was less than 10 percent. The report suggests that organizations can facilitate knowledge transfer from research institutions to SMEs through collaborative research and technology programs as well as through staff exchanges (by researchers and engineers placed in firms). According to the report, industry-research collaboration is weak in Azerbaijan with limited level of R&D even among high-growth firms.

Methodology

To analyze the impact of R&D investment by the companies on their innovative potential 300 companies operating in different industries in Azerbaijan formed the target sample for the study. The cross-sectional survey approach was used to collect data with questionnaires administered in person by trained research assistants during March-June 2016. Confidentiality and anonymity were guaranteed in order to stimulate cooperation and information from all the companies. Respondents were asked to respond to 12 multiple-choice questions.

Possible respondents are selected randomly from different sectors (manufacturing, retail, other) in Baku and other regions of the country. A total of 260 usable questionnaires were received representing a response rate of 87%. All received responses were used in the analysis with missing values and outliers deemed to be within acceptable ranges. Although there is no exact statistics about the size of target population of companies, number of received usable questionnaires is considered large enough when the difficulties during the data collection are taken into account.

Innovation activeness of firms was assessed by adopting a multidimensional approach. This included measures relating to product innovation (introduction of new products/services), process innovation (improvement of existing products) and international expansion (export of products).

The econometric analyses were conducted using Eviews. To conduct the regression analysis, Least Squares Model method was chosen.

Explanation of variables

The variables (dependent and independent) listed below were selected specifically for the purpose of our analysis to test the impact of TT (technology transfer) on the innovation activities. The questions included general information about the companies, such as the number of years the companies have been operating, size of the companies, field of operation, and form of ownership. Additionally, the respondents were asked the number of new products they introduced to the market (product innovation) or improved any products/services (process innovation), R&D investment in the last 3 years, and the number of licenses to new technology they purchased as well as partnership with research centers.

The list of the variables used in the regression analysis is as follows:

- NP (*new products*) measures product innovation and indicates the number of new products introduced to the market by the company over the past 3 years. Respondents are invited to select one of the answer choices – none, 1-10, 11-20, more than 20. Later, the categorical information is transformed to quantitative form by giving numerical values from 0 (if the answer is none) to maximum 3 (if the answer is more than 20);
- IP (*improved products*) is a measure of process innovation and whether there have been improved products by the company over the past 3 years. Based on yes / no answers, dummy variable is created, equals 1 if the company has improved products during the period, otherwise equals 0;
- Lis (*licenses*) refers to the number of licenses of foreign companies owned by respondent companies which participated in the survey. Respondents are invited to present information about the number of licenses owned by the companies from foreign firms, measured in number units;
- PRC (*partnership with research centers*) indicates the number of research centers that engage in partnership with companies, measured in number units provided by respondents;
- RD (*research and development*) shows the amount of R&D investment during the last 3 years. Answer choices include none, 1000-25000 AZN, 25001-50000 AZN, 50001-100000 AZN, and more than 100000 AZN. The responses were transformed to quantitative, starting from 0 (if the answer is none) to 4 (if the answer is “more than 100000”);
- F (*foreign ownership*) is a dummy variable, equals 1 if the company is completely foreign owned, 0 otherwise;
- L (*local ownership*) is a dummy variable, equals 1 if the company is completely locally owned, 0 otherwise;
- MF (*mainly foreign*) is a dummy variable, equals 1 if the company is owned by foreign and local investors and foreign investors possess higher proportion of ownership, and 0 otherwise;

- ML (*mainly local*) is a dummy variable, equals 1 if the company is owned by foreign and local investors and local investors possess higher proportion of ownership, 0 otherwise;
- P (*production*) is a dummy variable, equals 1 if the company operates in the production sector, 0 otherwise;
- R (*retail*) is a dummy variable, equals 1 if company operates in the retail service sector, 0 otherwise;
- O (*other*) is a dummy variable, equals 1 if the company operates in other sectors, 0 otherwise.

Models

To conduct econometric analysis, Ordinary Least Squares (OLS) method was used. The following equation was built to conduct the analysis:

$$y_i = \alpha_0 + \sum_{l=1}^a \beta_l x_l + \sum_{m=1}^b \gamma_m z_m + \sum_{n=1}^c \lambda_n \bar{\omega}_n + u_i$$

Where, $y_i \in (NP, IP)$, $x_l \in (P, R)$, $z_m \in (ML, MF, F)$ and $\bar{\omega}_n \in (RD, LIS, PRC)$. In other words, x_l is used to indicate the difference of NP and IP according to the sector (production, retail or other) in which the firm operates. Other sectors (O) is used as a comparison or base group in estimation. At the same time, to test for the correlation between foreign equity in a firm and innovation (z_m) was used along with fully locally owned enterprises (L) as a comparison group.

As it can be seen in the model, to show the innovation potential of companies, two dependent variables were used – NP (new products) and IP (improved products). In other words, the model is estimated separately for each dependent variable using the same independent variables. Therefore, two different regression equations are built.

Results

Data analysis and descriptive statistics

Among the 260 companies whose responses were accepted for analysis, there were companies who did not disclose some information included in the survey.

Overall, distribution of the respondents across sectors is as follows: 24.2% from production, 30.4% from retail, and 45.4% from other sectors. Accordingly, approximately 9% of respondent companies owned totally by foreign entities while 51.7% belongs to absolutely to local owners. In 16.2% of participated companies, majority of the shares is owned by foreign entities while local entities dominate in 23.2% cases in terms of ownership. Data features are given in Table 1.

Table 1: Descriptive statistics of variables

Variable	Observation	Mean	Minimum	Maximum	Standard Deviation
IP	260	0.876	0.000	1.000	0.329
NP	260	1.296	0.000	3.000	1.132
Lis	227	1.903	0.000	100.000	7.770
PRC	220	1.964	0.000	25.000	4.467
RD	236	1.136	0.000	4.000	1.336
F	259	0.089	0.000	1.000	0.285
MF	259	0.162	0.000	1.000	0.369
ML	259	0.232	0.000	1.000	0.423
L	259	0.517	0.000	1.000	0.501
P	260	0.242	0.000	1.000	0.429
R	260	0.304	0.000	1.000	0.461
O	260	0.454	0.000	1.000	0.499

Source: Authors' own creation

Standard deviation is quite high for two of the variables – «licenses» and «partnership with research centers», 7.8 and 4.5 respectively. Number of new products and the amount of R&D investment have standard deviation higher than 1, all other variables have standard deviation equal to or lower than 0.5. The outlier for “licenses” is the largest local mobile operator, which is a subsidiary of international companies and therefore possesses a higher number of licenses than other companies in the local market. Outliers for “partnership with research institutions” variables can also be explained due to the nature of the industry these firms operate in.

Interpretation of analysis

The results of the econometric analysis are given in Table 2. As indicated in the previous sub-section, the two dependent variables NP (model 1) and IP (model 2) are estimated using two different regression equations. For each model, relevant standard deviations are shown next to regression coefficients.

The results of the analysis show that variable *Lis* (number of licenses) does not have a statistically significant impact on the variable NP (number of new products introduced to the market). However, variables PRC (number of partner research centers) and RD (R&D investment) do have a significant positive impact on NP, PRC and RD have an impact on NP with a significance level of 10% and 5% respectively. As expected, this shows the firms that partner with more research centers as well as those that invest more on R&D expenses are more innovative than other firms.

The analysis showed that innovation potential of firms depends on the presence of foreign investment in the firm as well as on the sector of economy. Firms with higher level of foreign capital increases the innovation potential of firms. On the other hand, firms partially owned by foreign investors (mainly foreign and mainly local) have higher innovation potential in comparison with firms owned completely by local investors. However, it can be observed that the difference is not statistically significant ($p > 0.10$). The difference in the innovation potential of firms completely owned by foreign investors in comparison with firms completed owned by local investors is statistically significant ($p < 0.10$).

Table 2: Ordinary least squares (OLS) results

Variable	Model (1) $y_i = NP$		Model (2) $y_i = IP$	
	Coeff.	St. Dev	Coeff.	St. Dev
Lis	-0.002	0.003	0.017*	0.010
PRC	0.010*	0.0003	-0.004	0.018
RD	0.053**	0.021	0.240***	0.063
F	0.155*	0.089	0.574**	0.269
MF	0.062	0.071	0.275	0.214
ML	0.029	0.064	0.052	0.193
P	0.052	0.064	0.468**	0.195
R	-0.126**	0.056	0.270*	0.171
Const	0.774***	0.046	0.604***	0.140
Observations	196		196	
Std. Dev	0.337		1.019	
R ²	0.139		0.208	

Note: Standard deviation for the regression in each model is given in the second column. Stars *, **, *** respectively indicate 10%, 5% and 1% significance level.

When the innovation potential of firms with regard to the sector of economy in which they function was analyzed, it was determined that compared to the firms operating in production sector (P) firms operating in other sectors (O) had higher innovation potential, however the difference was not statistically significant $p > 0.10$. On the other hand, compared to companies operating in the retail sector (R), firms operating in other sector (O) had higher innovation potential, and the difference was statistically significant ($p < 0.05$).

The econometric analysis regarding the number of “improved products”, which is one the main indicators of innovation potential of companies, also reveal a similar result. Although the number of licenses has a positive relationship with IP, both

economic and statistical significance tests show that the relationship is weak. Results of empiric results indicate the partnership with research centers (PRC) does not have a significant impact on improving products (IP).

One of the main hypotheses in this research – statement that R&D expenses in a company strongly encourage innovation potential – has been proven, which is reflected in the results of the empiric studies. R&D has a positive impact on IP, which shows a positive relationship. At the same time, this relationship is both economically and statistically significant.

Econometric analysis reveals that as the share of foreign capital in firms increases, innovation potential of such firms also increases as evidenced by introduction of new and improved products to the market. Innovation potential of firms owned partially or mainly by foreign investors is higher than those owned fully by local investors, but the difference is not statistically significant. However, firms fully owned by foreign investors have significantly higher innovation potential than firms with other forms of ownership. The coefficient of the difference (0.574) is economically significant with a statistical significance level of 5%. This clearly proves the hypothesis that foreign investment participation is positively correlated with product innovation (NP) and process innovation (IP).

Analysis of the innovation potential between sectors indicates that production sector (P) leads other sectors. Compared to other sectors companies in the production sector have significantly higher innovation potential as measured by improved products ($p < 0.05$). Retails sector follows the manufacturing sector; however the statistical significance of this difference weak ($p < 0.10$).

Discussion of the results

The current study focused on how technology transfer can increase innovation potential of local firms. Econometric analysis of the survey results conducted among 260 firms from different sectors of Azerbaijani economy were conducted to test the relationship between independent factors, such as sectors in which the firms operate, number of licenses obtained, presence of foreign capital, level of partnership with research institutions and dependent variables of product and process innovation.

The results strongly supported the hypothesis that partnership with research institutions leads to increased potential of the firms to introduce new products to the market. This emphasizes the importance of establishing closer ties between the business sector and universities as well as research institutions. Universities and other higher education institutions (HEIs) are an important source of new scientific knowledge. The potential is even higher at universities that offer degrees in engineering and applied sciences (Pazos et al., 2012). Industry can gain access to this knowledge or resource by developing formal and informal links with higher education institutes (OECD, 1993).

Another important finding of the analysis was the impact of R&D investment on the innovation potential of the businesses. The econometric analysis showed

investment in R&D is strongly correlated with the potential of the firms to innovate. In addition to commercializing the results of R&D activities conducted by businesses themselves, effective commercialization of findings of research conducted at academic and research institutions is also important for increasing the competitiveness of businesses and national economies (Abdurazzakov, 2015; Abdurazzakov, 2016; Abdurazzakov, 2013). It is worth to note the importance of managing the intellectual property derived from the R&D activities. The literature on technology transfer and innovation emphasizes the importance of properly managing intellectual property to spur innovation on micro level (Van Norman and Eisenkot, 2017). The problems explored by our study are in line with the findings of Cygler and Wyka (2019), who concluded that the main barriers of international cooperation in R&D are mostly related to the fear of losing companies' independence, the fear of ineffective activities, and the fear of difficulties in estimating the potential costs and benefits of cooperation. These fears are mostly due to insufficient knowledge about R&D projects and poor infrastructure and business networks.

However, it was interesting to see that the analysis did not support the notion that the number of licenses obtained by the firms lead to product innovation. Finally, the analysis in the case of Azerbaijan revealed that participation of foreign investors in the ownership local businesses is an important factor to increase innovation potential. The firms with foreign ownership (fully, mainly or partially owned by foreign investors) were more innovative than firms fully owned by local investors. This shows the need to attract more foreign investors in order to increase the potential of firms to innovate. This notion has also been supported in the studies of Ghebrihiwet and Motchenkova (2017). The role of leaders/managers should also be underlined. Bilan et al. (2020) highlighted that managers play important role in organizational learning, which significantly enhances the firm's sustainability and competitiveness. An innovative culture plays a vital role in enhancing firm's sustainability and an open-minded leadership style of managers may create such flexible, innovative background that contributes to building a viable entrepreneurial ecosystem.

Conclusion

As emerging economies like Azerbaijan prioritize to move away from natural resource based economy to innovation based economy, it is essential to consider the impact of different mechanisms to stimulate innovation. The discussed and analyzed variables are similar in other countries as well, so the findings of this research can be applicable in countries beyond Azerbaijan that are in search of an effective path to innovation-based growth. For SMEs – as internationalization is not so frequent among these enterprises – attracting foreign investors is not the easiest way for innovation. Instead, establishing a strong entrepreneurial ecosystem, which is built on the cooperation of the business sphere, higher

educational institutions and research institutions is a more appropriate way of technology transfer and innovation. In this case, knowledge and technology transfer could be the starting point of product development and human capital improvements.

The novelty of the research lies in 1) surveying the SME sector which have less intensive innovation activities than large, capital intensive firms; 2) SMEs owned entirely by foreign investors are more innovative as compared to firms owned by local investors. The analysis suggested that SMEs which are completely owned by foreign investors are more innovative than those owned entirely by local investors. Overall, attracting foreign capital increases innovation potential of local firms significantly. Thus, the government of Azerbaijan could stimulate innovation by encouraging establishment of fully foreign owned companies in the country.

As with all research, this paper has some limitations as well. Despite the fact that this paper contributed significantly to the literature on the relationship between innovation, R&D activities of the firms and technology transfer in Azerbaijan more research should be conducted to analyze the drivers of innovation and technology transfer. Additionally, less is known about the degree of effectiveness of R&D in the innovation performance of developing countries as well as how partnership with research institutions may increase the innovativeness of the firms and Azerbaijan is no exception.

It is worth mentioning that there is a need for further research and to conduct a similar analysis in the context of other emerging countries and see how the factors included in this study may affect innovation potential of firms in a different context. Further research can also look into the impact of factors not included in this research (such as firm age, location, etc.) on innovation.

References

- Abdurazzakov, O., (2013). Role of Technology Transfer in Stimulating Innovative Entrepreneurship: How to Apply Korean Experience for Azerbaijan. *Journal of Qafqaz University* 1(2), 217-230.
- Abdurazzakov, O., (2015). Role of technology transfer mechanisms in stimulating innovation. *Acta Scientiarum Polonorum. Oeconomia*, 14(4), 5-12.
- Abdurazzakov, O., (2016). Stimulating Innovative Entrepreneurship: How to Apply US Experience for Azerbaijan. *European Conference on Innovation and Entrepreneurship*. Academic Conferences International Limited.
- Acs, J. Z., Audretsch, D. B., & Lehmann, E. E., (2017). National system of innovation. *The Journal of Technology Transfer*, 42(5), 997–1008.
- Acs, Z., Autio, E., & Szerb, L., (2014). National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy*, 43(3), 476–494
- Aliyev, K., & Gasimov, I. (2018). Fiscal policy implementation in Azerbaijan before, during and after the oil boom. *Contemporary Economics*, 12(1), 81-94.
- Audretsch, D. B., Lehmann, E. E., & Wright, M., 2014. Technology transfer in a global economy. *The Journal of Technology Transfer*, 39(3), 301-312.

- Appiah-Adu, K., Okpattah, B. K., & Djokoto, J. G. (2016). Technology transfer, outsourcing, capability and performance: A comparison of foreign and local firms in Ghana. *Technology in Society*, 47, 31-39.
- Audretsch, D. B., Link, A. N., (2018). Innovation capital. *The Journal of Technology Transfer*, 43, 1760–1767.
- Bilan, Y., Hussain, H. I., Haseeb, M., & Kot, S. (2020). Sustainability and Economic Performance: Role of Organizational Learning and Innovation. *Engineering Economics*, 31(1), 93-103.
- Block, J. H., Thurik, R., & Zhou, H. (2013). What turns knowledge into innovative products? The role of entrepreneurship and knowledge spillovers. *Journal of Evolutionary Economics*, 23(4), 693–718.
- Colombo, M., Mustar, P., & Wright, M., (2010). Dynamics of science-based entrepreneurship. *Journal of Technology Transfer*, 35(1), 1–15.
- Cygler, J., & Wyka, S. (2019, January). Internal barriers to international R&D cooperation: the case of Polish high tech firms. In *Forum Scientiae Oeconomia* (Vol. 7, No. 1,25-45).
- Dalenogarea, L.S., Benitez, G.B., Ayalab, N.F., & Franka A.G., 2018. The expected contribution of Industry 4.0 technologies for industrial performance, *International Journal of Production Economics* 204 383-394
- Fiet, J. O., Patel, P. C. (2008). Entrepreneurial discovery and constrained, systematic search. *Small Business Economics*, 30, 215–229.
- Foster G. M., 1962. *Traditional cultures and the impact of technological change*, New York: Harper & Row.
- Ghebrihiwet, N., Motchenkova, E., (2017). Relationship between FDI, foreign ownership restrictions, and technology transfer in the resources sector: A derivation approach. *Resources Policy*, 52, 320-326.
- Grimpe, Ch., & Fier, H. (2010). Informal university technology transfer: A comparison between the United States and Germany. *Journal of Technology Transfer*, 35(6), 637–650.
- Hasanov, F., (2013). Dutch disease and the Azerbaijan economy. *Communist and Post-Communist Studies*, 46(4), 63-480.
- Kopishynska, O., Utkin, Y., Kalinichenko, A., Jelonek, D., (2016). Efficacy of the cloud computing technology in the management of communication and business processes of the companies. *Polish Journal of Management Studies*, 14(2)
- Krugman, P. (1979). A model of innovation, technology transfer, and the world distribution of income. *Journal of political economy*, 87(2), 253-266.
- Kuriakose, S. (Ed.), (2013). *Fostering entrepreneurship in Azerbaijan*. World Bank Publications.
- Kwon, H. U., Park, J., (2018). R&D, foreign ownership, and corporate groups: Evidence from Japanese firms. *Research Policy*, 47(2), 428-439.
- Liao, S. H., Hu, T. C., (2007). Knowledge transfer and competitive advantage on environmental uncertainty: An empirical study of the Taiwan semiconductor industry. *Technovation*, 27(6-7), 402-411.
- Link, A., Rothaermel, F., & Siegel, D. (2008). University technology transfer: An introduction to the special issue. *IEEE Transactions on Engineering Management*, 55(1), 5–8.

- Lizińska, W., Marks-Bielska, R., & Serocka, I. (2014). Operations Performed by Business Environment Institutions in the Process of Foreign Investment Acquisition: a Case Study of Investor Service Centres. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 9(4), 65-78.
- Lundquist, G., (2003). A rich vision of technology transfer technology value management. *The Journal of Technology Transfer*, 28(3-4), 265-284.
- Mansfield, E., (1975). International technology transfer: forms, resource requirements, and policies. *The American Economic Review*, 65(2), 372-376.
- OECD Report, (1981). *The Future of University Research*. Organization for Economic Co-Operation and Development, Paris.
- OECD Report, (1993). *Small and Medium-sized Enterprises: Technology and Competitiveness*. Organization for Economic Co-Operation and Development, Paris.
- Park, S. H., Lee, Y. G., (2011). Perspectives on Technology Transfer Strategies of Korean Companies in Point of Resource and Capability Based View. *Journal of Technology Management & Innovation*, 6(1), 161-184.
- Pazos, D. R., López, S. F., González, L. O., Sandiás, A. R., (2012). A resource-based view of university spin-off activity: New evidence from the Spanish case. *Revista Europea de Dirección y Economía de la Empresa*, 21(3), 255-265.
- Slocinska, A., Depta, A., (2015). Knowledge Sharing Behaviour and Development of Small and Medium-sized Enterprises. *Theory, Methodology, Practice: Club Of Economics In Miskolc* 11(2), 69-78.
- Svarc, J., Dabic, M., (2019). The Croatian path from socialism to European membership through the lens of technology transfer policies. *The Journal of Technology Transfer*, 15 April 2019 online first, 1-29, 1476-1504.
- Turek, T., Dunay, A., (2014). *Information and communication technology (ICT) as a catalyst for cooperation between enterprises. A review of selected practical solutions*, 443-452. In: Kolcun, M., Borowik, L., Lis, T. (eds.) Current problems of maintenance of electrical equipment and management. Technicka Univerzita v Kosciach, Kosice.
- Twiss, B. C., (1986). *Managing technological innovation*. Longman Publishing Group.
- Van Norman, G. A., Eisenkot, R., (2017). Technology transfer: from the research bench to commercialization: part 1: intellectual property rights—basics of patents and copyrights. *JACC: Basic to Translational Science*, 2(1), 85-97.
- Wang, H-W., Wu, M-C., (2012). Business type, industry value chain, and R&D performance: Evidence from high-tech firms in an emerging market. *Technological Forecasting and Social Change* 79(2), 326-340
- Zhang, G., Tang, C., (2017). How could firm's internal R&D collaboration bring more innovation? *Technological Forecasting and Social Change*, 125, 299-308.

Internet sources:

- “Azerbaijan-2020: Look into the Future” Development Concept, Baku, (2012). Access date 20.07.2018. Retrieved from http://www.president.az/files/future_az.pdf

WPLYW TRANSFERU TECHNOLOGII NA INNOWACJE

Streszczenie: Celem tego artykułu jest zbadanie dwóch rodzajów relacji - pierwszy między działaniami badawczo-rozwojowymi firm a innowacjami oraz drugi związek między transferem technologii i innowacjami między przedsiębiorstwami w Azerbejdżanie.

Gromadzenie danych przeprowadzono poprzez ankiety wśród 300 małych i średnich przedsiębiorstw działających w różnych sektorach gospodarki w Azerbejdżanie. Nowość badań polega na: badaniu sektora MŚP, które prowadzą mniej intensywne działania innowacyjne niż duże firmy kapitałochłonne; i MŚP będących w całości własnością inwestorów zagranicznych które są bardziej innowacyjne w porównaniu do firm będących własnością inwestorów lokalnych. Rozwinięte i rozwijające się gospodarki przywiązują dużą wagę do transferu technologii jako katalizatora innowacji. Transfer wiedzy i technologii z generatorów takich technologii, w tym uniwersytetów i instytucji badawczych, do przemysłu pokazał swój wynik na przykładzie krajów, w których istnieje silny pomost między uniwersytetami a przemysłem. W innych gospodarkach, w których nie ma tak silnego powiązania między przemysłem a instytucjami badawczymi, innowacje można promować poprzez przyjęcie gotowej technologii opracowanej przez uniwersytety i przedsiębiorstwa za granicą. Wyniki analizy ekonometrycznej wskazują, że chociaż istnieje silny związek między inwestycjami w badania i rozwój a innowacjami, nie ma silnego empirycznego wsparcia, że uzyskanie licencji zwiększy potencjał innowacyjny firm. Z drugiej strony partnerstwo między firmami i ośrodkami badawczymi oraz uniwersytetami prowadzi do zwiększenia innowacyjności badanych przedsiębiorstw.

Słowa kluczowe: biznes, innowacje, potencjał innowacyjny, badania i rozwój, transfer technologii, uniwersytet, Azerbejdżan

技术转让对创新的影响

摘要: 本文的目的是研究两种类型的关系 -

第一种是企业的R&D活动与创新之间的关系, 第二种是阿塞拜疆企业之间的技术转让与创新之间的关系。通过调查对阿塞拜疆不同经济部门的300家中小企业进行了数据收集。该研究的新颖性在于: 1) 对中小企业部门进行调查, 这些部门的创新活动少于大型的资本密集型企业; 2) 与本地投资者拥有的公司相比, 完全由外国投资者拥有的中小企业更具创新性。发达和发展中经济体非常重视技术转让, 以此作为创新的催化剂。知识和技术从包括大学和研究机构在内的这种技术的产生者向工业的转移已在其大学与工业之间建立牢固桥梁的国家中得到了证明。在其他工业和研究机构之间没有如此紧密联系的经济体中, 可以通过采用国外大学和企业开发的现成技术来促进创新。计量经济学分析的结果表明, 尽管研发投入与创新之间存在密切的关系, 但并没有强有力的经验支持, 即获得许可会增加企业的创新潜力。另一方面, 公司与研究中心以及大学之间的合作关系导致所研究业务的创新性增强。

关键词: 商业, 创新, 创新潜力, 研发, 技术转让, 大学, 阿塞拜疆