

IMPACT OF STATE AID ON INNOVATIVENESS IN THE CONTEXT OF THE INNOVATION CAPACITY OF ENTERPRISES IN THE SME SECTOR

*Edward Stawasz**

Abstract

Background. Innovation and innovativeness play an important role in the development of economic entities under the conditions of increasing competition and the transition to the knowledge-based economy. Determinants of SME innovativeness are the object of growing interest of government policy supporting this sector.

Research aims. The presented paper is an attempt to determine the impact of state aid for innovation on innovativeness of enterprises in the SME sector. It also discusses the role of innovation capacity in the development of innovativeness of enterprises.

Method. The research consisted of a survey among 95 enterprises, which made use of state aid for innovative activity between the years 2008-2010. The average age of the enterprises surveyed was 19 by 2010, while the average number of employees amounted to 60 people.

Key findings. The analysis of research results does not confirm the hypothesis on the impact of state aid on innovativeness among Polish SMEs. However, important dependences were observed between innovativeness and innovative capacity as well as between innovative capacity and state aid.

Keywords: Innovativeness, State aid, Innovation capacity, Small and medium-sized enterprises

INTRODUCTION AND BACKGROUND

Innovation and innovativeness play an unquestionable role in the development of economic entities under the conditions of increasing competition and the transition to the knowledge-based economy. Determinants of SME innovativeness are an area of growing interest for researchers, as well as on government policy supporting this sector. The most effective way to turn innovation into a sustainable competitive advantage is to build innovation capacity, generally defined as the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of enterprises since companies compete by means of their capabilities for the development of new products rather than by means of new products (Lawson, Samson, 2001). Thus, state aid for building the innovation capacity of enterprises may be considered as an indicator of innovation success. In recent years, there have been a number of studies under-

* Dr hab. Prof. Edward Stawasz, University of Lodz.



taken on the concepts, areas, scope, instruments and strategies of state aid for innovation. They mainly focus on the determination of the nature of the resources and capabilities necessary for undertaking innovations by SMEs that require state aid. Due to resource constraints of SMEs, it is important to consider the support for building organisational capabilities of enterprises to provide a rapid response to environmental changes, the development of markets, technologies and business (Baldwin & Gelletly, 2003).

This paper attempts to determine the impact of state aid for innovation on innovativeness of companies in the SME sector. It also discusses the role of innovation capacity in this process. The second part of the paper presents the results of empirical studies on the impact of state aid for innovation on innovativeness of enterprises from the SME sector, taking into account the innovation capacity.

Innovativeness in Relation to State Aid for Innovation and the SME Innovation Capacity

One of the most important economic functions of the sector of small and medium-sized enterprises (SME) is the creation of innovation. Therefore, determinants of the innovative development of SMEs is an area of interest for researchers, as well as on government policy supporting this sector. The need of state aid for innovation in enterprises results from a high level of uncertainty and risk inherently associated with innovation, as well as from the rising costs of innovation. Another justification for the innovation policy is generating external effects for the entire economy (Lundström, Almerud, & Stevenson, 2008; Janasz & Koziol, 2007).

The relationship between state aid and the innovativeness of enterprises is the subject of numerous analyses and studies. However, these have a narrow scope and are limited to only one aspect of innovation as they are mainly concentrated on the study of the impact of state aid on the intensity and effectiveness of R&D activities undertaken by enterprises, and to a lesser extent on the analysis of the impact of state aid on innovation outcomes (Albors-Garrigos & Rodriguez Barbera, 2011). The latter approach takes into consideration a wider context of innovative activity encompassing the entire innovation process (the R&D phase and implementation), as well as a variety of internal and external factors that influence innovations and, as a consequence, affect the effectiveness of state aid (e.g.: diversity of companies by sector, technological intensity, the economic context, the scale of operations, the climate for innovation, etc.). It also stresses the role of innovation capacity as an important internal factor of the innovativeness of enterprises and as a moderator of the relationship between state aid and innovativeness (Baldwin & Gelletly, 2003; Edwards, Delbridge, & Munday, 2005).



The concept of the innovation capacity of enterprises is associated with the resources and organisational capabilities of a given enterprise which would enable the undertaking of innovations of a given type and scale, as well as their effective implementation. In the traditional approach to innovation, the innovation capacity is understood as a contribution to the process of innovation (mainly as formal expenditure on R&D) which results in an innovation outcome. In the latest models of innovation, the innovation capacity is presented as a complex, multi-factorial and multi-dimensional concept, encompassing many factors of an internal and external nature affecting the organisation, with dynamic capabilities playing a particularly significant role (Lawson & Samson, 2001). It is defined as a highly integrated capacity to shape and manage multilateral skills and resources (Terziovsky, 2007) as a combination of internal and external factors affecting the organisation that are related to its ability to implement continuous innovations (Romijn & Albaladejo, 2002), as the capacity to transform resources and knowledge into innovations and growth, encompassing technological competencies, physical, human, financial, network and managerial resources, dynamical capabilities and functional routines, as well as entrepreneurship seen as a prerequisite for the creation of innovation value (Liao, Kickul, & Ha, 2009; Zastempowski, 2010).

In terms of SMEs, state aid is further justified by the presence of market, system and regulatory imperfections creating problems for the functioning of this sector (Eshima, 2003). SMEs have problems with the assessment of innovation risk, as well as with building the innovation capacity (Forsman, 2009). From the point of view of the development of innovation capacity, state aid should be focused primarily on building the capacity to absorb – understood as the ability of the company to recognise the value of new knowledge, assimilate and transform it into a commercial outcome (Lawson & Samson, 2001). This includes assistance in access to specialised services for innovation such as: reducing the cost of access to information, facilitating the initiation of cooperation with research, financial and advisory institutions, disseminating new technical solutions, as well as direct financial aid for the R&D and implementation phase along with assistance in the implementation of innovative undertakings (Xu, Shou, & Liu, 2012).

The support policy for SME innovation is faced with a huge variety of innovative behaviours displayed by companies due to different competencies and needs in the field of innovation (Xu et al. 2012; Niedzielski, Stanisławski, & Stawasz, 2011). Studies on innovation in SMEs indicate that innovation is not necessarily the result of formal R&D activity but rather of the development of current business strategies, cooperation with customers or optimisation of business processes; innovations often encompass informal R&D (experiments, teaching, evaluation and technology



adaptation), which may result in the difficulty of distinguishing between the development of innovation and other kinds of business activity, particularly in small enterprises in which development activities are integrated with their current activity (Matusiak, 2010).

As shown above, this paper attempts to determine the impact of state aid for innovation on innovativeness of Polish enterprises from the SME sector in the context of innovation capacity. A correlation model is presented in Figure 1. The paper puts forward the main hypothesis of the positive impact of state aid on innovativeness of enterprises (H_1), as well as three auxiliary hypotheses: on the positive impact of state aid on the innovation capacity of enterprises (H_{1a}), on the positive impact of the innovation capacity on innovativeness (H_{1b}), on a moderating impact of the innovation capacity on the relationship between state aid and innovativeness of enterprises (H_{1c}).

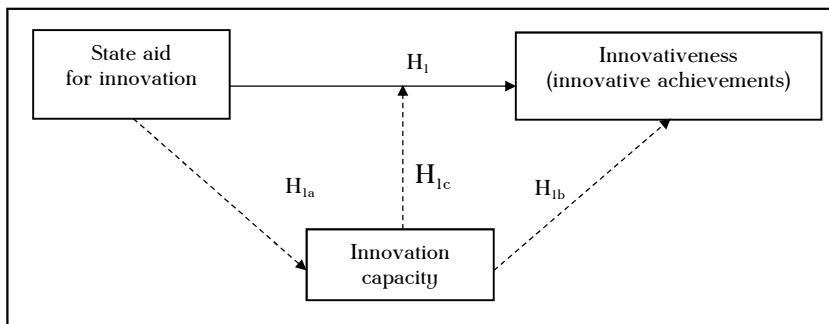


Figure 1. The Proposed Correlation Model

Source: The author's own compilation.

METHOD

The Nature of the Sample

A base of 18 innovative enterprises in the SME sector operating over the whole country was used in the paper. The study was conducted by the author in 2010 within the framework of a project for the Ministry of Science and Higher Education entitled "The policy to support innovativeness of the sector of small and medium-sized enterprises in Poland – the analysis of determinants and assessment of its implementation" (Niedzielski et al., 2011). In the years 2008-2010, a total of 95 enterprises, which constituted 52.5% of the entire sample, made use of state aid for innovative activity, in a broad sense of the term, encompassing R&D, as well as implementation.

The average age of the 95 surveyed enterprises was 19 in 2010, while the average number of employees amounted to 60 people. Medium-sized companies employing from 50 to 249 people, constituting 42.1% of the entire sample, dominated. Small companies, employing from 10 to 49 people, constituted 34.7% of the studied sample and the share of enterprises defined as very small, employing up to 9 people, constituted 23.2%.

Manufacturing enterprises (68.1%) constituted the largest group, then service (23.3%) and commercial (10.6%). In the spatial market structure of enterprises, the domestic market prevailed, where 72.6% of the companies operated, whereas 38.7% of the enterprises operated in the local market, yielding respectively 45.9% and 25.5% of total revenues. 53.7% of the enterprises operated in the international market yielding 28.6% of revenues.

RESULTS

Innovativeness of Enterprises

In the studied sample, all the enterprises undertook innovation activities in the years 2006-2009 that focused on the implementation of innovative solutions. In terms of the object and the degree of novelty in the introduced changes, the implementation of new or significantly improved technologies (73.7% of the companies) and the implementation of new or significantly improved products (69.5% of the surveyed companies) that are new to the enterprise only (88.4% of the companies) or new on the national scale (76.8% of the surveyed companies) prevailed. Organisational innovations were implemented by 62.1% of the enterprises. Novelties on the international scale were recorded in 62.1% of the companies.

The share of sales for new and improved products introduced between the years 2006-2009 in total sales for the enterprises in 2009 was adopted as the innovation index for the companies. The average of this index in the studied group was high and amounted to 26%, i.e. it was slightly higher compared to the level of the entire Polish industry (22.4%).

The enterprises were divided into two categories: companies characterised by decreased innovativeness, i.e. "by a lower share of revenues from novelties", in which the share of revenues from novelties in 2009 was lower than the arithmetic of the analysed index, i.e. 26% of total sales (62.5% of the total number of enterprises) and enterprises characterised by increased innovativeness, i.e. "by a higher share of revenues from novelties", in which the share of revenues from novelties exceeded 26% of total sales (37.5% of the sample). These groups of enterprises differ significantly in the value of the adopted index which amounted to 11.7% for enterprises characterised by decreased innovativeness and 47.4% for enterprises characterised by increased innovativeness (Table 1).



Table 1. Distribution of Enterprises in Terms of Innovativeness

Specification	Total number of enterprises (in %)	Innovation index (in %)
Enterprises characterised by decreased innovativeness	62.5	13.5
Enterprises characterised by increased innovativeness	37.5	47.4
Total	100.0	26.0

Source: The author's own compilation.

The Innovation Capacity of Enterprises

The index of the share of expenditures on R&D in total sales of enterprises was adopted as a measure of assessing the innovation capacity of enterprises (Table 2). The average level of this index in the studied group was relatively high and amounted to 7.1% in 2009. The enterprises were divided into two categories: enterprises characterised by low innovation capacity for which the level of the analysed index was lower than 7.1% (62.1% of the total number of enterprises) and enterprises characterised by high innovation capacity for which the level of the analysed index was higher than 7.1% (37.9% of the sample). These groups of enterprises differ significantly in the value of the adopted index which amounted to 3.4% for the enterprises in the first group and 15.8% for the enterprises in the latter group (Table 2).

Table 2. Distribution of Enterprises in Terms of Innovation Capacity

Specification	Total number of enterprises (in %)	R&D index (in %)
Enterprises characterised by low innovation capacity	62.1	3.4
Enterprises characterised by high innovation capacity	37.9	15.8
Total	100.0	7.1

Source: The author's own compilation

State Aid for Enterprise Innovation

In the years 2008-2010, a total of 95 enterprises, which constituted 52.5% of the entire sample, made use of state aid for innovative activity, in a broad sense of the term, encompassing R&D, as well as implementation. State aid was of a financial, as well as non-financial nature. Among the enterprises making use of aid for innovative activities, non-financial assistance dominated (37.9%). Only financial aid was received by 35.8% of the companies, while financial and non-financial aid was obtained by 26.3% of the enterprises. 30.6% of the companies received aid for the R&D phase and 69.5% of the enterprises for implementation.



A total number of 59 enterprises availed from financial aid for innovation, which constituted 62.1% of the entire sample. The surveyed companies made use of the assistance in the form of the EU guarantee fund, technological credit, first business programme, passport to export and micro-loans. Among the enterprises that did not make any use of the financial aid for innovation, 38.9% attempted to gain the aid but to no avail, while 61.1% of the enterprises did not apply for aid due to: no need for the aid or complicated and time-consuming procedures (respectively 16.6%). Among 59 of the surveyed enterprises that made use of financial aid, 17 companies (28.8%) received aid for R&D activity and 42 enterprises (71.2%) received financial aid for implementation activities associated with the conducted innovation activity. The share of financial aid as a source of funding for R&D activity was low and amounted to only 9% for the entire studied sample. If, however, the enterprises actually made use of financial aid for R&D, the share of this aid was high and exceeded half of the total funding for R&D.

A total number of 61 enterprises, which constituted 64.2% of the companies in the studied sample, availed from non-financial aid for innovation which encompassed consulting, as well as training and information about the need of innovation. This aid included: advisory assistance (31.0% of the companies), training assistance (31.0% of the companies), assistance in providing information regarding innovation (17.2% of the companies), facilitation of contacts with the environment (8.6% of the companies), facilitation of access to research information (6.0% of the companies) and facilitation of access to new markets (6.0% of the companies). More than 3/4 of the enterprises made use of at least two types of non-financial aid and only one company used all types of aid.

The paper has adopted the division of the enterprises according to the synthetic index assessing state aid for innovation by its scope and intensity (range: 0-1 points), where 0 points means no significance and 1 point great significance. The average assessment of the significance of state aid for innovation in the studied sample of 95 enterprises equalled 0.4 pts. On the basis of this index, the analysed enterprises were divided into two categories: enterprises characterised by having a low assessment of the significance of state aid, for which the level of the analysed index was lower than 0.4 pts. (62.1% of the total number of enterprises) and enterprises characterised by having a high assessment of the significance of state aid, for which the level of the analysed index exceeded 0.4 pts (37.9% of the sample). These groups of companies differ considerably in the value of the adopted index amounting to 0.26 pts for the first group and 0.62 pts for the companies from the latter group (Table 3).



Table 3. Distribution of Enterprises in Terms of State Aid

Specification	Total number of enterprises (in %)	Average index of assessment (in points)
Enterprises characterised by low assessment	62.1	0.26
Enterprises characterised by high assessment	37.9	0.62

Source: The author's own compilation

The assessment of the significance of state aid for innovation indicates diversity for different types of aid. The highest score was awarded to support which included both financial and non-financial aid (100% of the enterprises awarded high scores) and the lowest score was recorded for solely non-financial aid (100% of the enterprises awarded low scores). The sole use of financial aid was assessed as moderately significant (32.4% of the enterprises awarded high scores).

Correlations

Spearman's correlations (for nonparametric correlations) were used in order to determine correlations between innovativeness, state aid for innovation and the innovation capacity. The analysis indicates that the correlation between innovativeness and state aid for innovation in the analysed sample is poor (0.167) at the 0.01 level of significance. However, there was a clear correlation in the case of innovativeness and the innovation capacity (0.543), as well as the innovation capacity and state aid for innovation (0.351) at the 0.01 level of significance (Table 4). It can be concluded that state aid for innovation has a significant impact on the development of innovation capacity and that innovation capacity clearly affects the innovativeness of the surveyed companies.

Table 4. Correlations

Specification	Innovativeness	State aid	Innovation capacity
Innovativeness	1.000	0.167	0.543*
State aid	0.167	1.000	0.351*
Innovation capacity	0.543*	0.351*	1.000

The correlation is significant at the 0.01 level (bilateral)

Source: The author's own compilation

A more in-depth picture on the impact of state aid for innovation on innovativeness of enterprises can be seen in an attempt to correlate innovativeness of enterprises with the received state aid for innovation, which resulted in four types of studied enterprises (Figure 2). The largest group is made up of enterprises characterised by decreased innovativeness and



low state aid for innovation, which contains 42.1% of the companies (type I). The least numerous is the group of enterprises characterised by increased innovativeness, accompanied with having a high assessment of state aid for innovation (type IV - 17.9%). Enterprises characterised by decreased innovativeness and a high assessment of the significance of state aid (type II) and enterprises characterised by increased innovativeness and low state aid (type III) constitute respectively 1/5 of the sample. The above-presented data indicate considerable independence of both analysed factors, i.e. innovativeness and the significance of the received state aid for innovation. Only 60% of the surveyed companies satisfy this correlation (group I and IV). The increase in the significance assessment of state aid for innovation is accompanied by the increase in innovativeness in 52.8% of these types of companies. The increase in innovativeness of enterprises, in turn, is accompanied by the increase in the significance assessment of state aid in half of this type of enterprises.

Low innovativeness of the surveyed companies is related to their low assessment of the significance of state aid. This applies to more than 70% of this group of enterprises, only the remaining 29.8% of the companies received significant state aid. On the other hand, it should be noted that low state aid is associated mostly with enterprises characterised by low innovativeness (2/3 of this type of enterprises) and only 1/3 of these companies are highly innovative enterprises.

Innovativeness of enterprises	<i>Increased</i>	Type III 20.0%	Type IV 20.0%
	<i>Decreased</i>	42.1% Type I	17.9% Type II
		<i>Low</i>	<i>High</i>
		Significance of state aid	

Figure 2. Distribution of Enterprises in Terms of Innovativeness and State Aid (in %)

Source: The author's own compilation.

The analysis of innovation indices and innovation capacity indices of enterprises characterised by low and high significance assessment of state aid confirms the diversity of the distinguished groups of enterprises (Table 5). In the case of enterprises characterised by having a high assessment of the significance of state aid (group II and IV), a clear impact of the innovation capacity on innovativeness can be seen. Group IV is characterised by

having a high level of innovativeness and high innovation capacity, whereas group II is characterised by having lower innovativeness and lower innovation capacity. Thus, it can be concluded that the effectiveness of state aid for innovation requires the presence of high innovation capacity as a prerequisite for achieving a high level of SME innovation. It should be noted that a high share of financial aid as a source of funding for R&D activity (29.7% of total funding) was recorded in group IV, which along with the developed innovation capacity resulted in highest innovativeness in the studied population.

Table 5. Selected Characteristics for the Distinguished Types of Enterprises Characterised by Low and High Assessment of the Significance of State Aid

Company type	Innovation index (in %)	Innovation capacity index (in %)
I	11.6	3.72
II	12.06	4.35
III	42.11	7.85
IV	52.63	15.84

Source: The author's own compilation.

However, in the case of enterprises characterised by having a low assessment of state aid (group I and III), the impact of innovation capacity on innovativeness is less significant. Group I (dominating the entire population) is characterised by both a low level of innovativeness and a low innovation capacity, while group III is characterised by high innovativeness accompanied by a moderate (average for the entire population) level of innovation capacity. Thus, it can be concluded that low state aid for innovation accompanied by a low level of innovation capacity may result in low innovativeness. The case of group III (less numerous in the studied population) indicates that it is possible to achieve a relatively high level of innovativeness in the presence of a certain minimal (moderate) level of innovation capacity and low state aid.

It seems that in all the analysed cases, the innovation capacity is a necessary and essential condition for achieving high innovativeness, whereas state aid plays a complementary role supporting the innovation capacity of enterprises. State aid without the developed innovation capacity is not a very effective instrument in the development of SME innovativeness.

DISCUSSION AND CONCLUSIONS

The analysis of the results of the research conducted in the group of innovative enterprises in the SME sector does not confirm the hypothesis of



the correlation between innovativeness and state aid among Polish SMEs. The correlation between innovativeness and state aid for innovation in the studied sample was poor and insignificant. There was a limited correlation: the greater the aid for innovation, the greater the innovativeness of enterprises.

However, there were significant correlations between innovativeness and the innovation capacity, as well as between the innovation capacity and state aid for innovation, which confirmed the auxiliary hypotheses. It can be concluded that state aid for innovation has a significant impact on the development of innovation capacity and that the innovation capacity has a clear impact on the innovativeness of the studied enterprises.

The innovation capacity is a necessary and essential condition of a high level of innovativeness, whereas state aid serves as a complementary role supporting the innovation capacity of enterprises. State aid without a developed innovation capacity is not a very effective instrument in the development of SME innovativeness.

The effectiveness of state aid for innovation requires, therefore, a developed innovation capacity as a condition of its use to achieve a high level of SME innovation. This is particularly true of state aid for R&D activities.

REFERENCES

- Albors-Garrigos, J., & Rodriguez Barbera, R. (2011). Impact of public funding on firm's innovation performance. Analysis of internal and external moderating factors. *International Journal of Innovation Management, 15(6)*, 1297-1322.
- Baldwin, J., & Gelletly, G. (2003). *Innovation Strategies and Performance in Small Firms*. Cheltenham: Edward Elgar.
- Edwards, T., Delbridge, R., & Munday, M. (2005). Understanding innovation in small and medium-sized enterprises: a process manifest, *Technovation, 25*.
- Eshima, Y. (2003). Impact of public policy on innovation SMEs in Japan. *Journal of Small Business Management, 41(1)*, 85-93.
- Forsman, H. (2009). Improving innovation capabilities of small enterprises: cluster strategy as a tool. *International Journal of Innovation Management, 13(2)*.
- Janasz, W., & Kozioł, K. (2007). *Determinanty działalności innowacyjnej przedsiębiorstw*. Warsaw: PWN.
- Lawson, B., & Samson, P. (2001). Developing innovation capability in organizations: a dynamic capabilities approach. *International Journal of Innovation Management, 5(3)*, 377-400.
- Liao, J., Kickul, J.R., & Ha, M. (2009). Organizational dynamic capability and innovation: an empirical examination of Internet firms. *Journal of Small Business Management, 47(3)*, 263-286.
- Lundström, A., Almerud, M., & Stevenson, L. (2008). *Entrepreneurship and Innovation Policies. Analyses measuring in European countries*. Orebro: Swedish Foundation For Small Business Research.
- Matusiak, K.B. (2010). *Budowa powiązań nauki z biznesem w gospodarce opartej na wiedzy. Rola i miejsce uniwersytetu w procesach innowacyjnych*. Warsaw: Warsaw School of Economics Press.



- Niedzielski, P., Stanisławski, R., & Stawasz, E. (ed.) (2011). Polityka innowacyjna państwa wobec sektora małych i średnich przedsiębiorstw w Polsce – analiza uwarunkowań i ocena realizacji. *Zeszyty Naukowe, 654, Ekonomiczne Problemy Usług, 70*, 241-290.
- Romijn, H., & Albaladejo, M. (2002). Determinants of innovation capability in small electronics and software firms in southeast England. *Research Policy, 31*.
- Terziovsky, M. (ed.) (2007). *Building innovation capability in organizations. An international cross-case perspective*. London: Imperial College Press.
- Xu, Q., Shou, Y., & Liu, J. (2012). *Leverage Innovation Capability. Application of Total Innovation Management in China's SME's Study*. Singapore: World Scientific.
- Zastempowski, M. (2010). *Uwarunkowania budowy potencjału innowacyjnego polskich małych i średnich przedsiębiorstw*. Toruń: Nicolaus Copernicus University Press.

WPŁYW WSPARCIA PUBLICZNEGO NA INNOWACYJNOŚĆ W KONTEKŚCIE ZDOLNOŚCI INNOWACYJNEJ PRZEDSIĘBIORSTW Z SEKTORA MSP

Abstrakt

Tło badań. Innowacje i innowacyjność odgrywają istotną rolę w rozwoju XXX w warunkach rosnącej konkurencji i przechodzenia gospodarkę opartą na wiedzy. Determinanty innowacyjności małych i średnich przedsiębiorstw są obiektem rosnącego zainteresowania polityk publicznych wspierających ten sektor.

Cele badań. W artykule sformułowano hipotezę o pozytywnym wpływie wsparcia publicznego na innowacyjność przedsiębiorstw. Omówiono także rolę zdolności innowacyjnej w kształtowaniu innowacyjności przedsiębiorstw.

Metodyka. Badania przeprowadzona metodą ankietową wśród 95 przedsiębiorstw korzystających z pomocy publicznej na rozwój innowacyjności w latach 2008-2010. Średni czas istnienia przedsiębiorstw to 19 lat w roku 2010, natomiast średnia liczba zatrudnionych osób wynosiła 60.

Kluczowe wnioski. Analiza rezultatów przeprowadzonych badań nie potwierdza hipotezy o zależności innowacyjności i wsparcia publicznego wśród polskich MSP. Natomiast istotne zależności wystąpiły w przypadku innowacyjności i zdolności innowacyjnej oraz zdolności innowacyjnej i wsparcia publicznego innowacji.

Słowa kluczowe: innowacyjność, wsparcie publiczne, zdolność innowacyjna, małe i średnie przedsiębiorstwa

