

**SELECTED DETERMINANTS OF INNOVATION POTENTIAL  
IN THE AGRICULTURAL SECTOR  
IN THE VISEGRAD COUNTRIES**

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**Abstract**

*Innovation is one of key factors for the socio-economic development highlighted by researchers. While the literature of the subject is full of studies on innovation, reports and analyses usually concern the enterprise sector. This publication presents a comparison between the innovation potential in the Visegrad countries with particular focus on the agricultural sector in terms of social capital. For the purpose of analysis, the OECD, ESS and EUROSTAT databases were used. The results of analyses confirmed a positive relationship between trust and innovation activity with regard to the whole economy and to the agricultural sector. Therefore, the results of the studies point to possibilities of innovation-oriented measures aimed at building social capital, especially as Poland records the lowest levels of trust in the Visegrad Group.*

**Keywords:** innovation, social capital, trust, Visegrad Group.

**JEL codes:** A13, O13, O31.

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## **Introduction**

The European Union (EU) long-term programme for socio-economic development for the years 2010-2020 entitled “Europe 2020. A European strategy for smart, sustainable and inclusive growth” is one of many strategic documents pointing to the growing role of knowledge and soft factors of development in improving prosperity. The strategy points to a need for the EU countries to cooperate in order to recover from crisis, stresses a need to introduce necessary reforms resulting from the processes of globalisation and ageing of societies. It recognises a need to use resources rationally. While in the existing scientific and political discourse, there were no discrepancies in the context of innovations and their importance in the development processes, usually conclusions came down to increasing expenditure on R&D. The essence of this article is, however, an indication that in order to use innovation-oriented measures in an appropriate and effective fashion, social capital is necessary.

The Warsaw Declaration, signed in March 2017, foresees support for innovative economy by a strategic cooperation alliance of the Visegrad countries in the field of innovation. The objective of the Warsaw Declaration was to start cooperation among governmental institutions, self-governments, research institutions and university centres in the V4 Group countries. In the context of the objectives of the above-mentioned strategic alliance, it is important to assess the innovation potential of the Polish economy when compared to other V4 countries. The objective of the article is to present and assess the innovation potential of the Polish economy in comparative terms, with particular focus on agriculture. The analysis also verifies the relationship between trust and innovation. The hypothesis on the low innovation potential of the Polish economy was verified even within the Visegrad Group. In view of a belief in the power of social capital and its positive impact on innovation possibilities of society, the analysis is focused on this specific aspect of the innovation potential.

## **Research materials**

Over the last three decades, the Visegrad countries have undergone a transformation by strengthening local enterprise, improving the quality of infrastructure and initiating regional cooperation aimed at strengthening the Central and Eastern European countries economically on the international stage. There is a need for a long-term vision of development, whereas the historical and geopolitical conditions necessitate a common course of action undertaken by Poland, Hungary and Czechoslovakia, and then continued by the Czechia and Slovakia. Hence, it was the V4 countries which were analysed in this publication. Data on the innovation level has been taken from the European Commission’s annual European Innovation Scoreboard report. The information on innovation and expenditure on R&D in the area of agriculture (agriculture and veterinary sciences to be more exact) was acquired from the OECD statistics. Owing to the limited scope of this publication, only one aspect of social capital was analysed, as the focus was on trust, firstly,

because it is the most important component of the capital. The second reason for limiting the analysis to trust was the data availability. In view of a need for data comparability, trust was analysed within the meaning of the European Social Survey, i.e. as trust in other people, by identifying trust with public, generalised trust. Composed of non-measurable elements, social capital, as a soft resource, is a category which is difficult to present in comparative terms. It is also difficult to present its remaining components as figures and include them in international comparisons due to the fact that they are non-measurable. The category of trust makes it possible thanks to the studies conducted under the European Social Survey (ESS) where public trust is measured regularly, in a uniform manner, for all surveyed countries and at all stages of the study.

### **Innovation and social capital**

In view of the differences in the speed and conditions of the socio-economic development of countries in the age of globalisation, integration and promotion of socio-economic cohesion, there are still new questions about the sources of this development. Supporters of the new institutional economics point to the role of institutions in overcoming the economic underdevelopment. According to them, the differences between the poor and the rich world come down mainly to differences in the current institutional system, and analysing of institutions may be a key to understand the economic development (Legiędź, 2013).

Supporters of the new institutional economics note that even the best-prepared formal framework is not enough to shape and secure relations among entities. The reason are transaction costs guaranteeing the compliance with formal standards and the incompleteness of agreements concerning the future (Lissowska, 2008). This context necessitates the examination of institutions established to regulate cooperation among entities or their groups. These institutions are defined as “endogenously shaped and self-implementing, non-technological constraints on social interactions”, which include both the rules of interaction not only of economic but also of social nature, applicable pursuant to a contract or agreed conditions among individual entities, and formalised general rules (Tylec, 2016, p. 29).

As pointed out further on by Tylec (2016, p. 30), “the immaturity and incompleteness of the institutional structure may translate into the relatively poor efficiency of the functioning system of the economy, including lower productivity of production factors and worse competitive position of the economy in question”. A coherent institutional structure, based on informal institutions, fosters the accumulation of social capital and cooperation, which, in turn, helps achieve social objectives with regard to increasing the prosperity and wealth of society. If the institutional structure is not coherent, there is a high probability that achieving long-term social objectives, including those aimed at achieving economic success, is impossible (Tylec, 2016, p. 30).

Institutions play an important role in the economy also in the context of innovation, which in the scientific literature is presented as one of the key factors of

success and development of the economy. However, most analyses, reports and innovation growth strategies refer to enterprises as the main creators of innovation. Much less attention is paid to innovation analyses in the field of agriculture. As it is highlighted in the Biostrateg programme, the share of innovative solutions is insufficient due to the existing barriers, among which the authors of the programme mention market uncertainty, insufficient reflection of environmental benefits and costs by market prices, restrictions related to infrastructure and behavioural patterns, as well as lack of knowledge. They also point to the lack of investors' trust in innovative solutions encumbered with the risk of uncertainty as an important factor limiting the share of eco-innovations in the market.

The agricultural sector significantly differs from other sectors of the economy in the area of innovation, as reflected in the indicators such as, inter alia: labour and land productivity, mean age or level of education of farmers (Sikorska (ed.), 2015). It is therefore necessary to "increase innovation, modernise the agri-food sector and improve the level of knowledge of agricultural producers" (Rural Development Programme 2014-2020, 2014). Within the EU and national structures, institutions are established to support innovative activities in the agricultural sector, such as the European Partnership for Agricultural Productivity and Sustainability, or the Agricultural Knowledge and Innovation System. The barriers to increasing innovation of the Polish economy include, for example, the insufficient number of internationally important scientific centres. This barrier has been quite obvious and raised for years. Similarly, the argument regarding the insufficient expenditure on R&D will always be valid. However, more and more often, in many areas of economic life attention is paid to soft factors as a potential source of innovation and development. The NBP report (*Potencjał innowacyjny...*, 2016) on the innovation potential of the Polish economy, among the barriers, apart from those mentioned above, pointed to the low level of public trust. As stated in the afore-mentioned report, in many countries mutual trust of companies, institutions, and individuals supports innovation by facilitating cooperation, reducing the risk of innovation activity and by the more efficient flow of information.

Also, the Strategy for Innovation and Efficiency of the Economy (*Strategia Innowacyjności...*, 2013, pp. 14-15) mentions social capital, in addition to public finance and taxes, as a necessary area of adjustments allowing to achieve a clear improvement with regard to innovation and efficiency. The role of social capital in the socio-economic development has been noticed and recognised as so important that one of the integrated strategies focuses on social capital (Social Capital Development Strategy). The main objective of this strategy is the "highly competitive (innovative and efficient) economy based on knowledge and cooperation". The role of social capital in building such an economy is therefore undeniable and currently recognised at all levels. Citing the Lisbon Council Institute in Brussels (after: *Strategia Innowacyjności...*, 2020, p. 30), "the most important ability becomes an ability to formulate comprehensive solutions to new, unforeseen problems and to acquire new, diversified skills throughout life." In identifying areas requiring

improvements, or even political reforms with regard to maintaining and improving the innovation position, countries and regions are supported by innovation rankings being developed. The SII presented in Fig. 1 shows a successive improvement in the EU's results in this area in recent years.

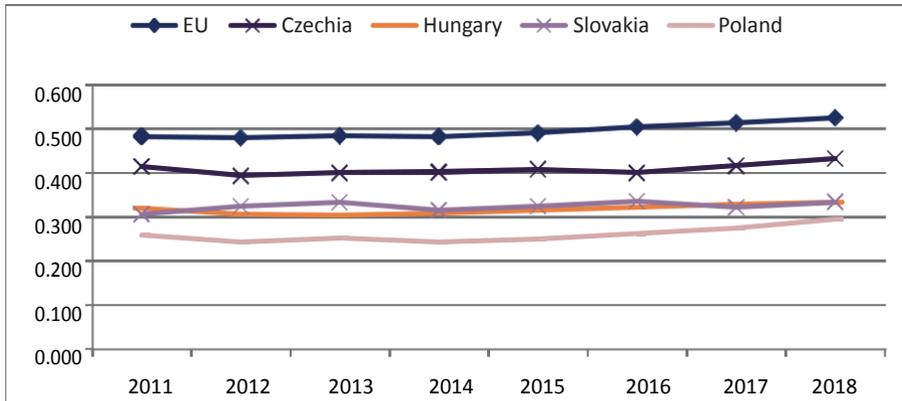


Fig. 1. Summary Innovation Index V4 and EU 2011-2018.

Source: own study based on the European Innovation Scoreboard data <https://data.europa.eu/euodp/pl/data/dataset/european-innovation-scoreboard-2019>.

Poland's innovation in relation to the whole economy is quite low and for many years has been a reason for which Poland is classified in innovation rankings into a group of the so-called moderate innovators. Unfortunately, also the comparison with the Visegrad countries points to the poor results of Poland (Fig. 1). In the years 2011-2018, among the V4 countries, the Polish economy had the lowest innovation index in each year. And although in this comparison all the V4 countries have the results below the EU average, Czechia is the closest to the EU average.

According to the definition adopted by the OECD (2005), innovation is the implementation of a new or significantly improved product, service, marketing method, organisational method in business practices, workplace organisation or external relations (OECD, 2005). In turn, in the field of agriculture, innovation may include, inter alia: initiation of producing products with specific characteristics; implementation of new production practices improving the production process; application of new solutions to reduce the negative environmental impact; modernisation of business premises and use of the most modern agrotechnical machinery (Józwiak, Kagan and Mirkowska, 2012).

However, the literature of the subject points more and more often to social aspects as crucial from the point of view of an enterprise and innovation (*Państwa Grupy...*, 2017). The level of social capital, public trust and local relations are the important stimulants of innovation.

The concept of social capital emphasises the informal manifestations of human relations and refers to the rule of socio-economic life based on values, trust and human interactions. Social capital guarantees the proper development of economic capital (Szymański, 2007). Standards, values and trust reduce transaction costs, contribute to reducing bureaucracy and control of government administration and result in shaping the development policy by cooperation between citizens and policy makers in terms of policy, mainly at the regional and local levels (Grootaert, van Bastelaer (ed.), 2002; Ray, 2006).

According to Chmieliński (2015, p. 23), “the development potential of rural areas has its origins in endogenous factors, especially in human and social capital, as well as in technical and social infrastructure determining the standard of living and settlement attractiveness of rural areas”.

The LEADER initiative financed under the RDP 2014-2020 includes support for the “local rural development” as part of the priority related to “supporting social inclusion, poverty reduction and economic development in rural areas”. The objectives formulated in this way focus on strengthening social capital, starting up economic activity and developing enterprise, improving the knowledge of the local community on the environmental protection, climate change and innovation, developing local products, preserving local heritage, developing public and non-commercial tourism, recreational or cultural infrastructure, developing road infrastructure ensuring territorial cohesion in the field of social inclusion (Rural Development Programme for 2014-2020). As noted by Wrzochalska (2015), the studies on the process of village renewal in Poland stress a need to reformulate the “mentality of rural residents, from passive reception of externally controlled processes to creative and organised attitudes and actions, consisting in taking responsibility for their immediate surroundings, as well as for the future”.

### **Innovation potential in the agricultural sector in the V4 countries**

The comparison of activity in the area of innovation in the agricultural sector of the Visegrad countries started with a comparison of GDP *per capita* due to the differences in the population of the countries analysed (Table 1). In each of them, there was a gradual increase in GDP *per capita* in each subsequent year. The hierarchy of the V4 countries remained unchanged in the analysed period, and each year the highest level of GDP *per capita* was characteristic of Czechia, while the lowest one of Hungary. In the analysed period, Poland occupied the third place, while in terms of the compared categories its indices were only slightly higher than those in Hungary. On the other hand, in GDP *per capita* in Czechia was, on average, by 0.75 higher than in Poland.

Table 1

*Gross Domestic Product per capita (GDP per capita) PPP (current international \$)*

Country	2013	2014	2015	2016	2017	2018
Czechia	30 485.71	32 263.32	33 691.42	35 230.52	38 019.58	39 743.60
Hungary	24 464.14	25 518.23	26 356.31	26 851.63	28 798.64	30 673.08
Poland	24 719.25	25 612.26	26 856.07	27 735.35	29 930.99	31 342.97
Slovakia	27 897.60	28 927.67	29 691.52	30 895.99	32 371.22	33 917.20

Source: own study based on the OECD statistical data.

The differences in favour of Czechia can also be seen in the list of global expenditure on R&D, the share of which in GDP of the country was nearly two times higher than in Poland (Table 2). Despite the annual growth observed in Poland in 2017, the share slightly exceeded 1% of GDP, while in the analysed period in Czechia the lowest level was 1.68% in 2016. Also, in Hungary the share was higher than in Poland. The lowest share of expenditure (Gross Domestic Expenditure on R&D – GERD) in GDP, which was almost at the level of 0.8 every year, was observed in Slovakia. The conversion of GERD *per capita* moved Poland down to the last position, and only in the last two analysed years Poland slightly outstripped Slovakia. However, according to this criterion Czechia's advantage was significant and in the early years it was almost 2.5 times higher than the GERD *per capita* value according to purchasing power parity (PPP) in Poland, while in recent years this difference has been slightly reduced.

The analysis of GERD's expenditure in terms of its focus on the agricultural and veterinary sciences sectors points to the reversal of the position in the ranking of the V4 countries (Table 2). The largest amount of funds allocated for this sector in each year in the analysed period was recorded in Poland. Each year, Poland spent about 2.5 more, and in 2014 even three times more, in current international dollars, than Czechia. However, while by 2014 expenditure on this sector was growing in Poland every year, after 2014 this trend was reversed. However, the higher level of expenditure expressed in nominal values results from the size of the Polish economy, which is the largest one in the Visegrad countries. In fact, when comparing the share of GERD expenditure on the agricultural and veterinary sciences sectors in GERD's total expenditure, there are visible differences to the detriment of Poland. Although the percentage is not the lowest among the analysed countries, the share of this expenditure in the Czech economy is still lower; in some years, Poland was outstripped by Hungary and Slovakia, although in this category there are large fluctuations in the individual years. The comparison of researchers per FTE researchers points to the advantage of Poland over the remaining V4 countries, which may result from the already mentioned size of the economy. The comparison of the selected categories indicates an increase in nominal terms, also in prices of 2005 adopted as a base year, but in recent years the upward trend has been either inhibited or even reversed, which is not a positive phenomenon in the case of such high needs.

Table 2

*Comparison of the selected innovation indices in the Visegrad countries  
in the years 2012-2017*

Country	Time	GERD <sup>a</sup> as a percentage of GDP	GERD <sup>1</sup> <i>per capita</i> (in current PPP\$)	GERD <sup>a</sup> – Agricultural and veterinary sciences (in '000 current PPP\$)	GERD <sup>a</sup> – Agricultural and veterinary sciences (in '000 PPP\$, constant prices – 2005)	GERD <sup>a</sup> – Agricultural and veterinary sciences %	Researchers <sup>b</sup> (FTE) – Agricultural and veterinary sciences
Czechia	2012	1.78	514.26	179 283.95	149 952.00	3.29	1197
Hungary		1.26	293.48	164 989.69	122 692.51	5.70	1267
Poland		0.88	209.04	370 455.32	291 677.18	4.64	3739
Slovakia		0.80	214.21	78 197.65	63 854.81	6.74	947
Czechia	2013	1.90	575.19	135 215.20	107 200.12	2.22	1265
Hungary		1.39	341.81	199 987.31	143 726.37	5.95	1348
Poland		0.87	214.52	418 434.26	322 260.07	5.11	3767
Slovakia		0.82	229.42	39 558.24	31 281.29	3.18	601
Czechia	2014	1.97	632.55	173 501.42	133 363.60	2.59	1274
Hungary		1.35	347.61	152 425.95	109 752.06	4.47	957
Poland		0.94	240.20	583 880.64	448 738.81	6.38	4018
Slovakia		0.88	254.11	95 747.53	74 953.24	6.94	866
Czechia	2015	1.93	646.59	186 220.29	144 066.69	2.72	1399
Hungary		1.36	361.48	170 347.48	123 248.46	4.82	1140
Poland		1.00	269.09	465 533.26	354 548.33	4.55	3953
Slovakia		1.17	347.14	150 363.13	119 353.56	7.97	985
Czechia	2016	1.68	589.00	162 625.61	123 028.58	2.60	1432
Hungary		1.20	325.38	164 125.33	119 566.97	5.17	1178
Poland		0.96	267.26	439 383.97	334 091.50	4.33	4312
Slovakia		0.79	243.25	83 223.51	65 384.71	6.29	998
Czechia	2017	1.79	677.87	182 681.63	133 282.56	2.53	
Hungary		1.35	390.70	..	..	..	
Poland		1.03	309.80	..	..	..	
Slovakia		0.88	285.28	..	..	..	

<sup>a</sup> Gross Domestic Expenditure on R&D

<sup>b</sup> Researchers by Agricultural and veterinary sciences (for R&D data), Full-time equivalent (FTE) of R&D personnel

Note: Agricultural and veterinary sciences (for R&D data): Agricultural sciences include: agriculture, forestry, and fisheries; animal and dairy science; veterinary science; agricultural biotechnology; and other agricultural sciences.

Source: own study based on the OECD statistical data.

It should be noted that expenditure on R&D in the Polish economy, although higher than in the other Visegrad countries, is not sufficient and does not rank Poland in the first place, as it is worth noting that Poland is a larger economy in terms of population than the other countries altogether. This means that the advantage that can be noticed in Fig. 2 is no longer so significant and can be explained almost by the very size of the economy.

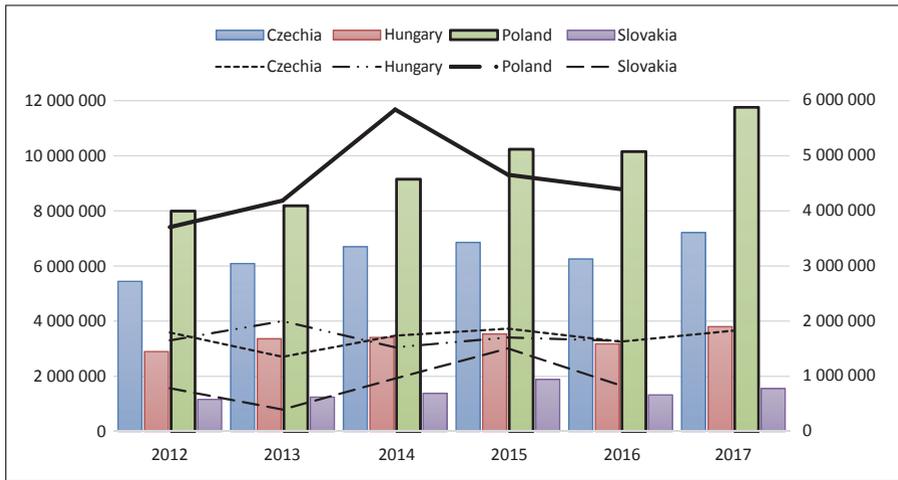


Fig. 2. Total Gross Domestic Expenditure on R&D (GERD) (column) and Gross Domestic Expenditure on R&D – Agricultural and veterinary sciences (linear) 2012-2017 (in '000 current PPP\$).

GERD in Purchasing Power Parities (PPPs): Total intramural expenditure on R&D performed during a specific reference period, expressed in Purchasing Power Parity dollars.

Source: own study based on the OECD data.

However, the greatest disparities can be seen in the area of innovation activity (Table 3). The highest share of entities whose activity relates to food products can be observed in Czechia, from 36% to 44%. In Slovakia, the share of such entities is also high, yet unstable. In this list, both Poland and Hungary strongly differ from Czechia and Slovakia depending on a year with the share of around 12% and 14-18%, respectively. Given the percentage of product and process innovators in food products, the situation is the same. Poland and Hungary achieve worse results with the share of about 5%, while Czechia recorded the share of 22% in 2012 and Slovakia even nearly 23% in 2010.

Table 3

*Percentage of innovation-active firms in food products and percentage of product and process innovators in food products*

Country	Percentage of innovation-active firms			Percentage of product and process innovators		
	2010	2012	2014	2010	2012	2014
Czechia	36.98	44.30	36.60	15.72	21.91	17.27
Hungary	18.61	14.19	15.08	5.84	4.49	4.65
Poland	12.59	12.42	11.42	5.23	4.75	5.17
Slovakia	40.41	19.30	33.15	22.71	7.89	12.94

Source: own study based on the OECD data.

### **Relationship between trust and innovation**

The authors of the report on the innovation potential of the economy and its conditions, determinants, and prospects (*Potencjal innowacyjny...*, 2016) presented the numerical relationships between social capital and the level of innovation of European countries. Among various components of social capital, most calculations referred to trust as the most important element in building innovation. An additional determinant of selecting trust for calculations was the data availability. The above-mentioned report used the Eurostat and Innovation Union Scoreboard (IUS) data and the results of analyses involving the EU countries indicated that the average level of public trust is strongly positively correlated with the IUS Summary Innovation Index (Table 4). The societies of the Scandinavian countries, i.e. Denmark, Sweden, Finland, but also Switzerland, are both the most innovative and trusting ones. On the other hand, there are the Central and Eastern European countries (especially Bulgaria, but also Slovakia and Poland) and Portugal.

The authors of this report also pointed to a strong positive relationship between public trust and the innovation index when using public trust indicators delayed by 2 years. Based on the calculations constructed in this way, they drew a conclusion that there was a direct (ignoring the labour efficiency) relationship between public trust and innovation.

While industrial sectors and enterprises are often the subject of an innovation-oriented analysis, fewer reports and analyses can be found with regard to agriculture. However, given the disparities in income, prosperity and other indices cited in public statistics presenting this sector of the economy in an unfavourable situation when compared to other industries, this publication analysed the data on trust and innovation, referring, wherever possible, to the agricultural data.

Table 4

<i>Impact of public trust<sup>1</sup> on innovation</i>				
Method	OLS	RE	OLS	RE
Efficiency <sub><i>t</i></sub>	<b>0.292</b> <b>(5.669)</b>	<b>0.237</b> <b>(5.242)</b>		
Trust <sub><i>t</i></sub>	<b>0.0515</b> <b>(3.192)</b>	<b>0.0341</b> <b>(2.483)</b>		
Efficiency <sub><i>t-2</i></sub>			<b>0.266</b> <b>(6.101)</b>	<b>0.163</b> <b>(4.979)</b>
Trust <sub><i>t-2</i></sub>			<b>0.0546</b> <b>(3.865)</b>	<b>0.0439</b> <b>(3.503)</b>
Constant	<b>-2.933</b> <b>(-5.730)</b>	<b>-2.260</b> <b>(-4.698)</b>	<b>-2.655</b> <b>(-6.157)</b>	<b>-1.491</b> <b>(-4.229)</b>
Number of observations	71	71	92	92
Number of countries		26		27
Corrected <i>R</i> -squared	0.618	0.627	0.613	0.620
Intragroup <i>R</i> -squared		0.196		0.177

<sup>a</sup> In this publication, trust will be considered only in terms of trust in other people and due to the data comparability of the concept of public trust, generalised trust should be understood in a similar way.

Notes: Innovation is measured by the Summary Innovation Index of the Innovation Union Scoreboard (IUS), “efficiency” refers to the logarithm of labour efficiency, measured as GDP per employee. The values of the *t* statistics are provided in parentheses. The bold text in the table indicates statistically significant variables of at least 5%. Random Effects Estimator (RE).

Source: Potencjał innowacyjny gospodarki: uwarunkowania, determinanty, perspektywy (Innovation potential of the economy: conditions, determinants, prospects), NBP, Warsaw 2016, p. 276.

In the rankings of generalised trust, the Polish economy has occupied one of the last places for years, while the most trusting are the residents of the Scandinavian countries. Also, in comparison with the Visegrad countries, the level of generalised trust among the Poles was the lowest in each analysed year (Table 5). 2012 was an exception; at that time the lower level of trust was characteristic of Slovakia. Both the average and the median in all V4 countries are below the EU average. From among the analysed countries, Czechia had the results close to the average for the European countries. The trust indices in Poland are also lower than those calculated for Hungary. In addition, in the years 2012-2018 no improvement in this regard is visible among respondents from Poland. Trust is a key component of social capital and thus one of the most important generators of further growth, as indicated by researchers analysing the impact of soft factors on the socio-economic growth (*inter alia*, Tóth, 2013; Donate, Ruiz, Sanchez de Pablo and García-Pardo, 2019; Serageldin and Dasgupta 2001; Serageldin and Grootaert, 2001; Pająk, 2001). The empirical studies conducted on a group of 56 countries, including Poland, and quoted by Czapiński (2010) also confirm a positive relationship between social capital and

the level of economic development. In Poland, the importance of social capital was also noticed, recognising that it is, in addition to land, labour, financial and human physical capital, a determinant of the development of economies (Matysiak, 1999; Sztudynger, 2005; Kaźmierczak, 2007; Sztompka, 2016; Tarkowski, 2017; more on the economic aspects of social capital in: Będzik, 2019).

In addition to the positive impact on many economic processes, it also contributes to innovation activity, which is undeniably recognised as a determinant of progress and socio-economic development. According to Woolcock (2001), the most modern equipment and the most innovative ideas in the hands or mind of the most brilliant, skillful person will not give much if this person has no access to other people to inform them or to improve and promote their work. Trigilia (2001, p. 429) notes that “the tendency to share information and trust can also facilitate the dissemination of economically valuable resources of innovative knowledge necessary for introducing new goods and services into the market, which always entails a risk”. The dependence of many characteristics of innovation (such as creativity, creating and then sharing ideas, implementing ideas, learning and cooperation) on the high level of trust within the stakeholder community, as repeatedly pointed out in the literature of the subject, is quite obvious if the entity is to function in the area of cooperation (*inter alia*, Barsch, Capozzi and Davidson, 2008; Bunduchi, 2013; Dovey, 2009; Godart, Gorg and Hanley, 2016; Lazányi, 2017). As Krzyżanowska (2013) aptly stresses in many publications, the better future will be determined by taking action to build trust in other entities and shaping and promoting the right attitudes of leaders. Only in such conditions does creativity develop and innovation emerge. The lack of trust is an important obstacle to establishing cooperation within producer groups, and the problem of development of groups/organisations of agricultural producers is important for the future of Polish rural areas and agriculture (Będzik, 2019, p. 57). The growth of innovation is not easy, and the growth of innovation in the agricultural sector is perhaps even more difficult due to poor cooperation and aversion to taking risk.

Data from the OECD statistics and European Social Survey was used in this publication to verify the relationship between trust and innovation, and then the Pearson's correlation coefficients were calculated. In this analysis, innovation activity was represented by the percentage of manufacturing firms engaged in in-house R&D. The results presented in Table 6 clearly indicate the dependence of innovation activity of the given economy on the level of generalised trust. In view of the data availability, the percentage of innovation-active firms in food products<sup>1</sup> was applied. The Pearson's correlation coefficients referred to activity related to food products, although lower than those calculated for the whole economy, also indicated this dependence. This means that rural areas and agriculture, which require further strengthening of indices to improve prosperity, have an opportunity to support innovation activities by

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<sup>1</sup> In the absence of separate data specific for the agricultural sector, a reference to the food industry was used in the paper, bearing in mind that this is not the area identical to the agricultural sector.

building and then multiplying social capital. Due to the usually time-deferred effects of wealth in social capital, the dependence of innovation activity of the whole economy and its part in the area of food products delayed by two years in relation to the level of generalised trust has also been checked.

Table 5

*Trust in other people in the Visegrad countries in the years 2012-2018*

Country	Median	Average	Minimum	Maximum	Standard deviation	Count
2012						
Czechia	4.4	4.4	0	10	2.4	1 988
Hungary	5	4.8	0	10	2.4	2 006
Poland	4.4	4.1	0	10	2.4	1 892
Slovakia	3.8	4	0	10	2.5	1 832
Total EU	5.09	4.92	0	10	2.49	54 453
2014						
Czechia	4.6	4.5	0	10	2.3	2 143
Hungary	4.3	4.2	0	10	2.4	1 695
Poland	4	3.9	0	10	2.4	1 612
Total EU	5.32	5.21	0	10	2.35	40 110
2016						
Czechia	5.3	5	0	10	2.2	2 265
Hungary	4.7	4.5	0	10	2.3	1 608
Poland	4.4	4.1	0	10	2.5	1 684
Total EU	5.41	5.27	0	10	2.37	44 272
2018						
Czechia	5.1	4.9	0	10	2.3	2 390
Hungary	4.9	4.7	0	10	2.5	1 696
Poland	4.3	4	0	10	2.5	1 496
Total EU	5.27	5.09	0	10	2.45	35 906

Note: Most people can be trusted or you can't be too careful

Source: own study based on the European Social Survey data available on <https://www.europeansocial-survey.org>

Table 6

*Pearson's correlation coefficients between the average level of trust and innovation activity in the years 2010-2014 (number of countries 19)<sup>a</sup>*

Variable	Innovation activity in total			Innovation activity in the area of food products		
	2010	2012	2014	2010	2012	2014
Trust	0.519	0.673	0.472	0.125	0.178	0.384
Trust <sub><i>n-2</i></sub>		0.554	0.406		0.108	0.257

$p=0.05$

<sup>a</sup> Countries included in the analysis: Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Lithuania, the Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland.

Source: own calculations based on the European Social Survey and UNESCO Institute for Statistics data: [www.europeansocialsurvey.org](http://www.europeansocialsurvey.org), <http://data.uis.unesco.org>

The calculations presented in Table 6 indicate the dependence of innovation activity on trust also with a two-year delay. Although the dependence for food products is lower than for the whole economy, it also shows a positive correlation between innovative activity and the level of trust. This means that the broadly defined agricultural sector with the ambition to catch up not only with the agricultural sector in the European Union countries, but also to improve its position in relation to other sectors in the domestic market should use all possible opportunities to shorten the distance. Such a success factor can be the building of trust and, consequently, of social capital, in accordance with the belief that a strong and efficiently functioning community is socially cohesive and has significant social and cultural capital (Dargan and Shucksmith, 2008). Therefore, it is proposed to take bottom-up initiatives which shape capacity and build networks of contacts, which helps strengthen social capital and cohesion in rural areas and, consequently, encourages the development of innovative methods by creating an environment in which innovators have a better chance to develop (EU SCAR, 2012). It should also be stressed that the process of adapting innovation to the agricultural sector is long-lasting and, as a consequence, also the effects of implementing innovative solutions, resulting in structural changes, due to the specific nature of the sector, will be visible only in a long-term perspective (Piecuch and Szarek, 2018).

Innovations must yield tangible results, and, as noted in the publication entitled "Knowledge Transfer and Innovation in Rural Development Policy" (2013, p. 2), in the literature of the subject "there is a wide consensus that interaction among farmers, researchers and rural entrepreneurs is needed to drive successful innovation: an interactive innovation model, based on the voluntary participation of actors in a group project is expected to be the guiding principle of innovation in the future". This means that the effectiveness in innovation activity depends to a large extent on the wealth in social capital, without which human interactions, cooperation and involvement are not possible or at least could be severely impeded.

### **Summary**

In the public and scientific discourse, there is a consensus that innovations are essential in the further improvement in prosperity. The growing awareness of a need for the co-existence of social capital as a breeding-ground for innovations can also be noticed. The formulated research hypothesis stating that the Polish economy shows the weaker innovation potential than the other countries in the group in question, based on the analyses carried out, has been confirmed to some extent. Poland occupies a dominant position among the Visegrad countries in several areas identifying the innovation potential (e.g. Total Gross Domestic Expenditure on R&D), while in relation to most indices it occupies low positions. In addition, the analysis confirmed a positive relationship between the level of generalised trust and innovation activity, not only for the whole economy, but also in the broadly defined agricultural sector. The highest innovation index was characteristic of Czechia, just like the level of generalised trust, which, given the results of the presented analyses, can be a factor increasing the effectiveness of research and development activities being undertaken. This indicates sensitive areas for decision-makers, politicians, innovation creators and those responsible for creating socio-economic development strategies, including agricultural and rural development strategies, which should be taken into account in these processes. However, the basic recommendation refers to social capital as an element essential in the innovation process, because, while all recommendations are aimed at increasing expenditure on R&D expenditure, which is logical and obvious to everyone, without social capital, expenditure on R&D can prove inefficient, or even go to waste, as without the ability to cooperate, trust, commitment and, therefore, without social capital, no level of expenditure will be sufficient. To implement the effects of research work, we need a person which is part of a group, a team in which there are interactions, human relationships and social capital.

In the context of the analysis, attention should also be paid to a difficulty in shaping the structure of informal institutions. It cannot be implemented from any other economy, since the characteristic feature of institutions, social capital and its components is their endogenous nature. Therefore, a need to increase efforts to create and then multiply national trust and social capital is even greater.

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## WYBRANE WYZNACZNIKI POTENCJAŁU INNOWACYJNEGO W SEKTORZE ROLNYM W KRAJACH GRUPY WYSZEHRADZKIEJ

### Abstrakt

*Innowacyjność jest jednym z kluczowych czynników rozwoju społeczno-gospodarczego, akcentowanych przez badaczy. O ile jednak literatura przedmiotu obfituje w badania na temat innowacyjności, to zwykle raporty i analizy dotyczą sektora przedsiębiorstw. W niniejszej publikacji zaprezentowano porównanie potencjału innowacyjnego w Krajach Grupy Wyszehradzkiej, ze szczególnym uwzględnieniem sektora rolnego przez pryzmat kapitału społecznego. Do analizy wykorzystano bazy danych OECD, ESS oraz EUROSTAT. Wyniki analiz potwierdziły dodatnią zależność między zaufaniem a aktywnością innowacyjną w odniesieniu zarówno do całej gospodarki, jak i sektora rolnego. Wyniki badań wskazują zatem możliwości działań proinnowacyjnych ukierunkowanych na budowanie kapitału społecznego, zwłaszcza że spośród Grupy V4 Polska notuje najniższe poziomy zaufania.*

**Słowa kluczowe:** innowacyjność, kapitał społeczny, zaufanie, Grupa Wyszehradzka.

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