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– Instytut Geografii, Zakład Przedsiębiorczości i Gospodarki Przestrzennej
Pedagogical University of Cracow
– Institute of Geography, Department of Entrepreneurship and Spatial Management

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Introduction

Celebrating the 100th anniversary of the Polish Geographical Society (1918–2018) allows for making attempts at summarising research achievements to date in the field of geography of industry and services, as well as for proposing syntheses of previous research results. We assume that they facilitate a more and more precise recognition of changes in the spatial structure of industry and the dynamics and functional changes of enterprises as its basic elements.

In the process of development of geography of industry, as in other scientific disciplines, visible are successive stages associated with the strive for a deeper understanding of processes governing the functioning of enterprises as basic elements of more complex spatio-sectional structures of industry. Among them we would like to emphasise the following: description of the object of study, explaining the process of its location and development, developing the concept of model approach, determining development goals, verifying adopted hypotheses, predicting further directions of changes, and building a theory.

Proposals for further development and undertaking new research themes should refer to the changing conditions caused by the growing technological, social, economic, and cultural progress. It should be taken into account that said processes occur in varied conditions which may affect polarisation in terms of the level of development in spatial structure of industry or the balancing of existing disparities.

We assume that learning about the complex processes of development and functional transformations of industries, as well as spatial structure of industry constitutes an important premise for controlling economic changes in order to systematically raise the level and the quality of life of the society. Balanced management of changes is the more effective, the more it is based on accurately justified claims concerning the variability of intensification of factors influencing changes in the socio-economic and cultural potential.

Apart from epistemological problems, development of geography of industry is associated largely with the possibility of applying its research results in economic practice. This is done mainly through providing patterns theoretically justified and empirically verified that will allow for making rational decisions, realising certain objectives of economic and spatial policy, evaluating said objectives, and the possibility of predicting future transformation processes.

In reference to the above-mentioned, the present volume contains works relating to attempts at determining the directions of research in the field of geography of industry and services.

Papers presented study the issues of the shaping of industrial and services enterprises, sample results of empirical research, public statistics resources, and new research concepts in the field of geography of industry.

Academic identity of scholars representing specific scientific disciplines plays an important role in works on the location of business entities. To varying degrees said disciplines put emphasis on determining the complexity of conditions in locating business entities, their competitiveness, and the needs of economic practice (K. Kuciński). Of great significance is also research on behaviours of large business entities in geographic space. In this contexts, three main trends related to world research were presented: transformational-globalisation, localisation, and behavioural (P. Śleszyński). They are related to the behaviour of international enterprises which influences processes of internationalisation of production and expansion to foreign markets (A. Tobolska). This is also illustrated by research on global corporations (W. Kilar).

In Polish literature on the subject, research issues of geography of industry undergo certain changes. They are mostly connected with processes of technological development of industry and changes in managing economy reflected by the transition from centrally controlled economy to market economy (T. Rachwał). Varied development conditions affect different investment attractiveness of economic activity and lead to increasing polarisation processes (H. Godlewska-Majkowska). It was noted that analysis of individual sectors of economy requires new and often different research methods, as indicated by research on the development and functions related to maritime industries (P. Czapliński).

Construction industry plays an important role in the study of processes of economic development. This is evidenced by an analysis of research directions in geography of construction. Special attention was paid to issues of construction and assembly production and investment processes (T. Marszał, A. Ogrodowczyk). In market economy the development of entrepreneurship significantly influences the dynamics of socio-economic development in spatial systems of different scale. This is suggested by intensive research, particularly in the period of implementation of market economy rules. It was emphasised that said issue is of interdisciplinary character and among it significant are research results achieved in the field of geography of industry (T. Rachwał). Intensifying technological progress changes economic structures by lessening the importance of industry in favour of developing service activity. The growing importance of the sector in national economic entail more dynamic research into geography of services which exhibits increasingly closer ties with geography of industry (J. Dominiak).

Subsequent works present the results of undertaking new research themes. They include multiplier effects resulting from the relationship between industry and its surroundings (K. Wiedermann), changes in spatial structure of intensively developing automotive industry (B. Domański, K. Gwosdz), and changes in spatial structure of innovation of Polish industry (P. Brezdeń). Also presented was a literature review on the topic of geographic proximity, its subjective and objective measuring (G. Micek), as well as public statistics resources as the source of information for studies in geography of industry (W. Gierańczyk, M. Ryczkowski).

Assuming there is a need for a synthesis of previous research in order to formulate general theory of geography of industry, a new, holistic concept of research into the functioning and development of industrial enterprise and spatial structure of industry was presented. The concept takes into consideration various relationships relating to: conditions of business in geographical space, impact on changing its potential of economic development rules, functional diversification of industrial enterprises in spatial structure of industry, competition between different spatial systems,

category of market environment, and relations between power elites and types of policies (Z. Zioło).

We are aware of the fact that the content of various articles is open to question. Therefore, we encourage you to express your views and to further develop research issues of geography of industry and services, including presenting theoretical approach leading to the formulation of general theories on the functioning and development of industrial enterprises, as well as industry and services sectors in spatial systems of different scale.

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Academic Identity of Researchers Investigating the Location of Business Entities

Abstract: The issue of the location of economic entities, which is crucial for economic geography, is becoming the object of ever more thorough analyses undertaken by the growing number of various academic disciplines, and especially those included in economic sciences, which paradoxically initiated this trend of research. This results from the cognitive interests of these disciplines, but also the needs of economic practice related to the perception of the complexity of conditions and the implications of the location of economic entities and its significance for their competitiveness. Each of the disciplines studying this issue does it a bit differently, and the analyses they make are a function of the academic identity of the researchers who conduct them. It is institutionally conditioned and determined by their education and practical experience, while the dynamically treated location theory plays a crucial role in its formation. However, the question remains whether the academic identity of the researchers of the location of economic entities shaped around this theory should be complex, nomadic or explicitly defined, and how the postulate of interdisciplinary investigation of location issues should be understood in this context.

Keywords: academic identity; analysis; business entity; interdisciplinarity; location; theory

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Introduction

If we say that for some time the location in the modern economy has been crucial three times over, it shows the importance of the location of economic entities for the economically safe implementation of their missions, goals and strategies. It also testifies to the role of spatial structure, considered in various geographical scales, within which these economic entities arise, function and develop, as well as the importance and complexity of glocalisation conditions and the implications of running a specific business in a given place and time.

This location triad also applies to the fact that today it is not enough to make the right decision about where to run a specific business. It must continuously be analysed dynamically and contextually; this place must be perceived concerning a particular and general location in all geographical scales of the operational space of a given economic entity.

This kind of locational triad also pertains to the criteria for assessing the impact of location factors on the functioning and development of a given economic entity. It is no longer just a matter of looking for a location that ensures minimisation of costs or maximising profits, or their satisfactory optimisation, but also competitiveness and economic security.

It is also a matter of considering the location of economic entities from the point of view of a possible strategy of adapting the place to the location requirements of a specific economic entity, the expectation of adopting this entity by this site, or treating it temporarily with a view to migration or regulation of a pre-selected location.

At the same time, it is also necessary to look threefold at the location of the analysed location of economic entities that cease to be distinctly industrial, and more and more often become both service and commercial service entities operating not only in real, but also virtual economic space of local, regional, and sometimes also global dimension.

Added to this is that the site analysis is undertaken and carried out both by economics and management sciences, as well as economic geography studies by economists or geographers, and it is becoming increasingly the subject of research interest of numerous other disciplines. Also, it is not only a manifestation of the imperialism of these disciplines but it results from the increasingly felt need of interdisciplinary analysis of the multiple conditions of the location of economic entities and its various consequences.

All this makes it indifferent to who the location researcher is, whom he considers himself and whom he is considered to be. In a word, the question is what his academic identity and its provenance are, how this identity manifests itself, whether it is homogeneous or multiple and synergically complex[1] and whether a given researcher by any chance is not a question for himself.

Provenance and the essence of academic identity

There are such concepts and categories of thought and the words that define them, which over the years do not evoke any emotions, and then suddenly, in changing socio-cultural conditions, become extremely important. Identity became such a term and word. It was spoken about out loud when it was realised that community was disappearing. Besides, unfortunately, there came the time people had to explain who they are and why, as well as who they are not, and especially who they do not intend to be, or in any case will not be.

Identity is becoming all the more critical, the more seemingly homogeneous communities start dividing, and their former components become heterogeneous and introverted; the more important for the functioning of these communities is the unambiguous belonging of their members.

[1] In the sense of this complexity presented in the second chapter (Kuciński, 2015a).

"The idea of 'identity' arose from the crisis of belonging, the desire to build a bridge between what 'belongs' and what 'is', to raise and transform reality to standards and the similarity of this idea" (Bauman, 2007). So it is not only to take over this identity, to acquire it and to realise that it is owned, but above all to create it for and in oneself by building it from these standards.

Moreover, this is done in a situation where there are many options to choose or create an identity. Also, "in essence, it is a supermarket where you can pick what you want and to what extent you refer to it" (Szczerek, 2018) with your life and actions, remaining more or less loyal to the implications of your choice.

It is by no means easy because building identity "is a simultaneous fight with melting and fragmentation; it is the idea of devouring and at the same time the steadfast resistance to devouring" (Bauman, 2007). The construction of this identity, however, becomes necessary in the contemporary diversifying world. It is also necessary for modern science, which is a subject to increasingly stronger specialisation, and at the same time feels the need for a holistic approach. This applies to today's science in general and is particularly acute in the scientific study of economy and management, which are the subjects of interest in various fields of science and their disciplines and specialities, and at the same time which are studied from very different points of view.

To tell people what economy is like and how it works, as well as how it develops, and how management evolves, and in particular what regularities it shows, you need to know who you are. You also need to be aware from what perspective and through which prisms one looks at entities, phenomena and economic processes. For this message to be understandable, it must also be known to those for whom the effort is made to study specific fragments of economic reality and their location.

The determination, or rather self-definition, of the academic identity of a researcher of economy and management, is needed to himself, so as he knew how and why he researches them in that way, but it is also necessary from the point of view of the stakeholders of his research awaiting the ideological and intellectual clarity of what they are offered as a result of this research. They want to know whom they are dealing with and what they can expect from him, what to expect from his work, how to read it and how to interpret it, and especially whether they can and want to identify with the views expressed in these works.

It is not indifferent to the provenance of the scientist's academic identity and his conviction as to how, when and under what circumstances he took this identity over or created it and realised that he has it, how he understands it and how he makes use of it. You can have doubts about the researchers claiming that they always had a clearly and unequivocally defined academic identity, they knew who they were as scientists, whom they would like to be, and what this implies for their research. Those who wanted to be somebody else but become those who they are, are more reliable. On the other hand, researchers who do not know who they are and who do not bother themselves about it are entirely unreliable. They do not know what discipline and speciality they teach, why they undertake specific research problems and try to solve them in a specific way.

If the researcher does not have a clearly and unequivocally determined academic identity and if he does not lose the mental and intellectual freedom necessary within it, his research achievements are homogenised. Also, when their individuality and heterogeneity are lost, they cease to be one of a kind. Something is lost then, and this thing is

what science is all about, which makes the researcher original and builds his position in the scientific environment, which makes him someone.

Doing science, you must know who you are as a researcher, whom you want to be and whom you want to be considered for. At the same time, however, one must always "go ahead / ... /, and not in the dead laurels leaf stubbornly decorate the head"[2] (Asnyk, 1956). One cannot, however, "trample the altars of the past", because "on them, the holy fire is still burning"[3] (Asnyk, 1956). Creative researchers "should bless them"[4], because without these "altars" they would not be themselves, as well as it would be impossible to create works that try to bring new content to the discipline and speciality.

Science is a kind of rebellion, it is a rebellion against the legacy, it is an attempt to validate earlier ideas and theories, it is a striving to improve or supplement them, it is a new look at what others have been watching not seeing what has now been seen and learned from this enriching science conclusions. However, it is a very specific contestation and questioning the current scientific achievements because it is rooted in it, and is full of respect for the achievements of predecessors, on which "arms" creative researchers stand.

The greatness of practising researchers is based on the fact that they know what, how and why to contest and what to accept in the present scientific achievements created by others, but also by themselves. It is challenging. On the one hand, the reverse of the developing science of creative intelligence is foolishness, which requires treating the existing knowledge, especially the one created by oneself, as something inviolable and somehow sacralising it. On the other hand, the whole questioning of existing knowledge is, in principle, impossible, because in a sense it would deny the undertaken research projects before they are made and implemented, considering that they must be, in one way or another, rooted in this knowledge.

Doing science, you cannot uncritically believe in what the existing theory says, but you cannot voluntarily ignore this theory, especially if you do not know it well enough or do not understand it. By rejecting existing knowledge, we lose the foundation on which the one we intend to create must be based, but without questioning this foundation, it is impossible to make a step forward in science.

In principle, you cannot take this step, seeking inspiration only in the theoretical foundations of the discipline and scientific speciality with which we identify, which we try to do and to which we want to be counted as researchers of. It is necessary not only to be competent in the so-called literature on the subject of the study, but also, or perhaps first and foremost, being an intellectual looking for heuristic inspirations in broad humanist knowledge, but also in this natural science, especially that of the natural sciences.

Being aware of one's academic identity and its specificity, one cannot forget even for a moment that the discipline and speciality with which we identify is "stuck" in its field of science, and at the same time, like it, is a subsystem of science understood as a socio-cognitive system.

It is also necessary to be aware of the fact that practising science is an endless process of cognitive discoveries and disappointments always taking place in a specific

[2] A. Asnyk (1956). Daremne żale. In: *Asnyk wybór poezj*i. Warszawa: Nasza Księgarnia, 113–114.
[3] A. Asnyk (1956). *Do młodych*. *Op. cit.*, 188.
[4] *Ibidem*.

cultural, social and historical contexts, as well as a political context specific to the place and time in which this process is undertaken and then implemented.

This process has its methodological, methodical and institutional procedures and algorithms, but it is not true that there is only one way to achieve the goal of solving the research problem and approaching the truth about the object of cognition. There are many ways, and it is not only important what you can discover following them, most often by accident, but also what you can find out, what you can see, and most importantly what you can understand better or even understand at all.

Therefore, by adopting a specific strategy for solving a research problem, one must first think about how to solve the problem and, after a while, think about it again, but completely different. Then you have to go along one of these paths, which seems to be as original as an optimal solution, or choose a hybrid path, which should not be sought but followed merely towards the goal to which one is heading. Ideally, it would be the path on which "Indiana Jones" will most likely meet "Albert Einstein" (Krakauer, 2018), and the work that will be created when we reach the goal of a scientific wandering will be the one that its author would like to read on a given subject himself.

Going along such a path is especially recommended when reality of the subject of the cognitive process is complex, and at the same time unstable, as modern economy and everything that is connected with it, as well as what is going on in connection with it, and when analysing all this should also have the character of research of real, as well as alternative realities.

It is especially justified when thinking about economic subjects, phenomena and processes, we move away from thought constructions inspired by mathematics and physics to treating economy and management as analogues of animate world analysed by biology. Following such a path is particularly justified when we want to determine how much what we examine is deterministic and how much stochastic when we try to find a moment of balance between regularity and randomness of the subject matter of the study.

Such an approach requires a harmonious acceptance of the description with the explanation obtained through its deepening and the resulting understanding with the formalism of effective laws and theories. This allows us to discover a new order of supposedly known, and at the same time unknown, economic reality. Learning this reality ends successfully only when the adopted principles of its research refer not only to the processes and phenomena analysed by physics and classical economics, but also see the biological and cultural, and especially social, nature of scientific research into the economy and management as well as the location of economic entities.

For such a cognitive process to be possible, a dialectical approach to the academic identity of researchers in economy and management is necessary, and above all being guided by principles of methodological and methodical principles in research work. The point is that economics, while remaining economics, and geography remaining geography, is a science tailored to the challenges posed by the modern economy, while economists and geographers who study it, as well as representatives of other academic disciplines and specialities, are still the same as before, but showing entirely another view of the subject of their research, allowing to perceive its complexity, and in particular to capture its instability, spatial diversity and socio-cultural and spatial contexts.

For this to be possible, they should have their academic identity, but it cannot be treated dogmatically. They cannot be excluded from engaging in solving challenging research problems generated by the differences that shape this identity and their understanding of the field and discipline of science. Neither can it be an identity that is so far alienated from the mainstream of economics or geography, that there would not be any "bridge" if one had to withdraw from its sublime and very original perception, in particular analysing, economy and management (Bauman, 2007). The researcher of economic subjects, systems, phenomena and processes should have a clearly defined and revealed academic identity, but should not treat it dogmatically or statically. On the one hand, it is the existing attribute of the researcher, and on the other hand, something that becomes and evolves during scientific research into economy and management, in particular, the location of economic entities and their location spaces.

It requires constructive criticism of yourself, your discipline, your speciality, your scientific community and your mentors, combined with respect for all this and all those who have shaped us as researchers. On the other hand, however, it should not be that the only thing that characterises us as researchers is the uncritical pride of belonging to a given scientific circle that does not allow to perceive its weakness and that makes us fiercely defend it even against those adversaries who are in fact right.

Researchers of the location of business entities

Academic identity determines the field and discipline of science in which we place our research interests. It specifies the specialisation practised, and above all the theme of the studies. It suggests research problems one perceives, the way of solving them and the way of announcing the results obtained, as well as generalising the statements formulated on their basis. It happens that the same problems are undertaken on the basis of various fields and disciplines of science by researchers with a completely different academic identity. They look at the same thing, seeing, however, in what they observe various properties of the object of interest, seeing its different provenance and different implications, different cause-effect relations and various regularities of functioning and development of what they have to study. Sometimes they see the same, but not in the same way, and the conclusions they reach are not the same, and even if they are identical, they verbalise them differently.

A spectacular example of such a situation is research on the location of economic entities and attempts to create theories explaining the mechanism of making location decisions and recommending methods of conducting location analyses. When undertaking this kind of study, one must be aware of one's academic identity and not only the one arising from academic education, but the final one generated by formal and informal education, as well as life and, especially, practical experience. At the same time, it is essential not only whom the researcher considers himself to be, but in fact who he is in the sense of academic identity.

This also applies to the authors of studies dealing with various aspects of the location of enterprises or facilities in which business activities are undertaken and conducted. Before reading the papers, and joining their authors on an intellectual journey, we must think for a moment who they are and why they see the subject of their scientific fascination as they try to present it to us.

The issue of locating business entities is primarily a matter of interest to economists and economic geographers[5], but also psychologists analysing the way of making location decisions and their behavioural determinants, sociologists studying social aspects of this process and social perception of its consequences, as well as anthropologists for whom economic objects and entities resulting from this decision process are significant, a relatively permanent element of material culture, culturally generated and creating culture.

Location of economic entities is also interesting for planners analysing their location in the spatial structure of settlement units, spatial planners, for whom it is important to locate these objects in the spatial structure of regions at different levels of geographical scale, and architects interested in the form of material substance of these objects and its functional implications.

However, it is important not only how the location decision is made and how the localised objects are incorporated into the spatial structure of places of their location, and how the economic entities operating in these facilities are incorporated into the economic structure of these places, how they are adopted by these places and/or what adaptation of these places to the location requirements of these enterprises is, but also what regulations are in force in this respect. This, in turn, means those interested in these issues include lawyers who create legal norms regulating the process of making location decisions, analyse the manner of applying these regulations and their economic, social and ecological consequences considered from the point of view of the publicly achieved objectives.

Each of these analysts of the location considered as a decision process, actual or hypothetical situation, treats the issues of the location of the surveyed business entities in settlement and spatial units slightly differently seeing it in the ontological, epistemological and methodological field, in the discipline and scientific specialty with which he identifies himself and on the ground of which he conducts his research.

It happens that these representatives of so many fields, disciplines and specialities are so strongly immersed in their domains that they are becoming a problem for themselves, losing in a way the essence of their interest in the location of enterprises. They especially do not notice its structural and institutional context, which somewhat requires us to see in a different light the issue of the location considered from their point of view, and somewhat differently interpret what seems to be so obvious and unambiguous. They sometimes seem to forget that in describing, analysing and explaining the world in which we live, the paper they write is not so important; it is the problem itself that should be taken and, more importantly, solved not only locally and specifically but universally.[6]

A particular problem begins when a location researcher, having a specific academic identity, tries to approach the subject of the study as if he had a completely different one and asks to be asked, quoting the point of one of the songs of the musical Jesus Christ Superstar, "Do you think you're what they say you are?".

[5] It is also said that economic geography is, in essence, a theory of location, especially when it attempts to grasp the universal regularities of deployment in the space of the economic activity of a human being and its social life, when it tries to capture the conditions, connections and spatial implications associated with this arrangement (Kuciński, 1994).

[6] Vladimir Nabokov drew attention to this, saying in *Laughter in darkness* that "What counts is not the book we write, but the problem it puts – and solves".

Sometimes it is difficult to follow the course of thinking of the researchers of locations who have substantively complex scientific identities[7]. I am half-hearted if their way of analysing the location is indeed interdisciplinary, multidisciplinary, transdisciplinary or cross-disciplinary (Kuciński, 2010), which is a challenge for the reader of the publication presenting this analysis. Worse, if this inter-, multi-, trans- or cross-disciplinary is alleged and in fact is a kind of smokescreen covering the superficial nature of the conducted study, which does not analyse anything, fluctuating towards the contexts of what it should be focusing on.

The mainstream of studies on the location of enterprises is connected, however, with researchers who want to be economists or geographers, and sometimes whose academic identity is partly economic, and partly geographical. The economist who studies economy and management treats the location of economic entities primarily as a microeconomic issue. Depending on the accepted criterion, he is looking for a place in space that due to its importance of the location factors for the given type of economic activity and its scale, is the optimal or suboptimal solution for this economic entity. On the one hand, he aims to detect the regularities governing the process of making location decisions and its possible regulation, and on the other hand, tries to recommend specific procedures for praxeologically and economically efficient implementation of this process.

The way in which he tries to accomplish these tasks depends on the specifics of his academic identity. The economist who identifies with the naturalistic (scientistic) methodological model of practising economic analysis perceives the issue of location somewhat differently, while somewhat differently does it the one who adheres to the principles of the humanistic (anti-scientistic) or modified naturalistic model (Kuciński, 2010; Kuciński, 2014a). The key here is the selection of quantitative or qualitative methods of analysis or attempting to hybridise them. Also noteworthy is the way non-economic location factors are treated in this analysis, which mainly depends on whether the researcher analyses the location in the mainstream of economics or whether he or she takes it on the basis of institutional, behavioural or moral economics, as this leads him to particular exposure of specific location factors and methods of their analysis.

It is not without significance whether, being an economist and being able to look at issues of location and related risks (Kuciński, 2014b), he can look not only through the prism of economics but also other sciences dealing with the context of localisation. If he does not, he becomes a bore and is almost dangerous (Hayek, 1967), because he is partially sighted, "and if he is partially sighted, he cannot rationally prove what he is trying to prove and thinking that he knows, in fact, he does not know" (Kołodko, 2008). It seems to him that he is rational in how he thinks, and especially in what he does and what he says, while in fact, analysing the location of economic entities, he only rationalises his own actions and thinking, not wanting to admit blindness, deafness and often stupidity, either his own, or location decision-makers, whose actions and their consequences are being investigated (Kuciński, 2017).

For the assessment of character, quality, cognitive value, theoretical depth and practical utility of a given location analysis, it is not enough to say that its author is an economist. What is also important is what kind of economist he is and how he

[7] Understood as presented by M. Polański in the second chapter ("Interdisciplinary scientific identity") of the book (Kuciński, 2015a).

implements the ontological, epistemological and methodological recommendations of undertaking and conducting such an analysis, which results from the specificity of his identity.

This also applies to the location analyses undertaken and conducted by economic geographers, for whom the issue of distribution and location of economic entities in settlement and spatial units is an essential element of their research field. The economic geographer, however, is not interested in what location to choose for a given economic entity, how to do it, and how it will affect the economic efficiency of the given enterprise and the possibilities of its development, as well as its economic security[8]. The subject of his research interest is how economic entities are distributed, what location and spatial values of the places they are located in have caused that they are there and what the result is for these places in the sense of the choreological economic, social, spatial and environmental implications.

Whereas for an economist analysing the location of a given economic entity, the critical category is the costs of economic activity borne by the enterprise, or its native economic system, due to the specific location of this economic entity, its locally implied competitiveness and economic profitability, for the economic geographer spatial conditions and the consequences of undertaking and conducting this activity in a given place are essential.

No wonder then that an economic geographer, more than an economist, is interested in the local and regional, increasingly international and global location system, the place of a given economic entity in this system, relations occurring in this system and its relationships, considered in various geographical scales, in relations with other spatial systems of the economy affecting or generated by a given location.

In this view, the issue of the location of enterprises is reflected in the economic geographer's distinctive academic identity. It is based on the specificity of geography as a science, which offers a comprehensive view of multidimensional and, at the same time, hierarchically analysed places and spatial units of various levels of regional taxonomy.

In this analysis, it is not just about saying how, where and why exactly, but not otherwise, economic entities are located, but also about indicating potential opportunities for their secure economic location resulting from the comprehensively assessed attractiveness of location of specific settlement and spatial units.

Recapitulating the characteristics of research attitudes of economists and economic geographers analysing the location of economic entities and the location attractiveness of places, one can say that the approach to this analysis resulting from their academic identity is in a sense the reverse and obverse of the location issue. The economist's view is introverted, and the economic geographer is extroverted. The economist focuses on the enterprise itself, and the geographer on the place of its location. As a consequence, the economist is primarily interested in how the features of the place affect the functioning, and in particular the possibility of economically safe development of a given enterprise, and the economic geographer is interested how the existence of a specific

[8] More and more current in the dynamically changing local, regional and global market, social, natural and institutional environment, the issue of location-determined economic security of enterprises is presented in a series of books prepared under my supervision and published by the CeDeWu Publishing House. In addition to the two already mentioned publications (Kuciński, 2014b, 2017) these are: Kuciński, 2015b, 2017, 2018.

enterprise in a given place affects the characteristics of this place determining social life underway in it, and especially its economic manifestations. Thus, the economist is primarily interested in the prospectively dynamic approach, while the economic geographer in particularly a static approach.

Increasingly, however, it turns out that such a single view is *ex definitione* defective and insufficient, mainly because of challenges resulting from the specificity of modern economy. The location is generally no longer static, but it is a dynamic process of choosing and changing the place of conducting a given business activity. It has more and more different conditions. There are more and more different consequences, and not only for a given economic entity and the right place of its spatial location. In this situation, the ideal solution would be the integration of both methods and goals of practising the location analysis. It would be favoured by the complex academic identity of an economist who is both a geographer or a geographer who is also an economist, or at least is thinking like a professional researcher in economy and management. Its creation is by no means unrealistic and in many cases has already become reality.

The premise for shaping such a complex identity is primarily an isomorphic usage by the economic geography of the location theory and methodology of the location analysis created predominantly on the basis of economics and by economists. On the other hand, appreciation of the importance of the spatial dimension of the economy and the spatial conditions of its functioning and development is popular among economists, mainly due to M. Porter and P. Krugman, and earlier to W. Isard. The acceptance, and even a kind of fetishisation, of interdisciplinary approach to the study of economy and management is also significant.

Moreover, contemporary analysis of the location of enterprises requires an interdisciplinary, and therefore a holistic approach, benefiting from the isomorphism of science. The only thing is that it should be authentic, substantively justified, methodologically correct, cognitively and pragmatically fruitful, and this requires that it should be conducted by researchers with complex scientific identities and the resulting real competence to undertake and conduct such interdisciplinary analysis of the location of economic entities.

However, as such investigators are not easy to find, it would be an optimal solution to entrust location analyses to teams composed of economists, economic geographers, urban planners, spatial planners, sociologists, environmentalists, as well as lawyers, observing, and above all understanding the need for multi-level and multi-faceted, and at the same time comprehensive perception of spatial issues of the conditions and implications of taking up and running a business in a given place. Only such conduct of the location analysis of economic entities today has a cognitive and practical meaning, provided, however, that it is appropriately embedded in the intelligently and creatively used theory of location of business entities.

Location theory as a component of academic identity of the researchers of the location of business entities

An essential element of the researcher's academic identity is theory explaining the essence, conditions and functioning of the object of his research interests. It is the axis around which this identity is formed, it moderates it, or becomes the cause of its transformation. Academic identity, embedded in the broad context of his general and

specialist knowledge, determines the ontological, epistemological and methodological perspective of the undertaken studies and analyses. It tells you what to study, how to do it and how to report the results. What is important here is not only what constitutes the subject and content of this theory; the degree of its maturity is also remarkable, its genesis and evolution, the directions of its development and their premises, the controversies, possible gaps or understatements around it are also significant. The thinking that characterises the researcher of a particular problem is contextually shaped by this theory, while its perception and cognitive implications depend on the specificity of the academic, intellectual formation of a given researcher and the intellectual subsoil resulting from what he encounters.

A perfect exemplification of this process is how the location theory influences the academic identity of analysts trying to answer the question regarding what determines the specific location of business entities, how this placement works and how the place in which it is located and the relationship of this entity with its suppliers influence the given entity, cooperating parties, competitors and clients as well as social and institutional stakeholders.

It starts with the very origin of the location theory, which has evolved in relation to the need, cognitively and pragmatically determined, for explanation and, above all, understanding, the mechanism governing the search by economic operators for an optimal or at least satisfactory location from the point of view of economic efficiency, its evaluation and a possible adjustment, sometimes called regulation. Thus, the theory of location, since its beginning, has been an example of the so-called functional theory resulting from the generalisation of localisation behaviour of enterprises and aiming at the rationalisation of these behaviours. Also, as a practical theory, it pragmatically guides the academic identity of researchers undertaking various aspects of the location of entities economic. Such an understanding of this theory has also become a leading recommendation for its analytical applications and its inductively generated improvement.

Such a recommendation organising the location analysis also constitutes the fact that the location theory has always aimed at identifying the location factors and subliming those that at a given stage of economic development and in given technological and market conditions, as well as institutional conditions, were the leading ones, somehow determining a specific location. At the same time, it was about determining how this factor affects the actual and alternative costs of conducting a given business activity and their economic consequences, and capturing the secondary location factors deforming this impact, which makes the issue of the location to be considered holistically making holistic thinking a vital feature of the academic identity of its researchers.

Exposing the need to comprehensively analyse the location of business entities also results from the fact that the location theory, while being a microeconomic concept, seeks the possibility of simultaneously perceiving the spatial implications of a given location appearing at various levels of geographical scale. It treats the location as a factor forming or transforming the spatial organisation of the economy on a local, regional and macro-regional scale, and sometimes goes beyond the boundaries of national economic spaces. Thus, it perceives the issue of localisation regarding its feedback to the spatial structure of the economy of settlement and spatial units in which the given economic entity is located, or is being located, thus changing the location and spatial value of the place of its location because it affects its conditions. This, in turn, requires

localisation researchers who, as part of their academic identity, would consider a cybernetic and systemic approach to the systemically viewed subject of the study.

Paying attention to the economic implications of the impact of the leading location factor on the functioning and possibilities of development of an economic entity within a given location, the location theory is guided by the specific logic of the perception of spatial relations in the convention of analysing their equilibrium. It is at the same time a kind of microeconomy of space that considers the allocations of business entities and spatial balance through the prism of the price mechanism. It requires that analysts of the location of enterprises see it through the eyes of a microeconomist, for whom macro-economic, macro- spatial and regional aspects of a given location are a meaningful context, but only a context, not a subject of direct analysis. Direct analysis of this context is in the sense of the theory of location a regional science research field, which is complementary to the micro-economic analysis of the location of entities, economic analysis of the economy and management, as well as their spatial conditions. Location theory suggests that these are two different perspectives and two completely different approaches. Although they are the obverse and reverse of the issue of the location of economic entities, these two analyses should not be carried out simultaneously. Their goals are different, and they require different predispositions and intellectual competences from the researchers undertaking these analyses. The study of the impact of the environment on the enterprise requires the researcher to have more the academic identity of an economist, and the analysis of the impact of the company on its surroundings requires to look at this issue through the eyes of an analyst with a geographer's academic identity.

Conducting these analyses, one must remember that historically speaking, location theory has its roots in studies of agricultural land use, which indicates its geographical, rather than economic provenance, although the reasoning on which these studies were based, or actually the methodology that led to their theoretical generalisation, was concordant with thinking and instrumentation used by economists. It was because the 17th and 18th century political economy only perceived the issue of location, but the theory announced by J.H. Thuenen in 1826 (Thuenen, 1826) became the synthesis of these peregrinations. However, it did not have far-reaching heuristic, cognitive and practical implications for a long time. They appeared only from economics at the end of the 19th century, and their crowning was the theory of the location of industrial production plants published by A. Weber in the first decade of the 20th century (Weber, 1909).

It was an approach with all the features of reasoning that reached the essence and the subject of economics, or economic sciences as would be said today, because it shifted the emphasis from the analysis of space to analysis of time. However, it created the prerequisites for undertaking studies on industry-specific localisation behaviour of various types of economic activity and formation of their spatial organisation, directing these analyses towards the field of research of economic geography and regional science.

Thanks to these studies, previously treated paradoxically marginally by economic geography, the issue of localisation, being a somewhat *ex definitione* the essence of its research field, gained the full right of citizenship in economic geography, and for economic geographers it became essential, not to say the main subject of research interest in this discipline of science and scientific specialty. It was undoubtedly related to the growing awareness of the importance of spatial conditions for the functioning and

development of micro-economic entities implied by dynamic economic development. It was also a consequence of the fact that space and the components of the geographical environment necessary for taking up and doing business, as a result of this development became an increasingly limited and less accessible, and above all generating conflict resulting from the possibilities of their competitive applications.

No wonder then that the theoretical concepts that were fundamental to the contemporary analysis of the location and academic identity of its researchers appeared in Germany at the beginning of the 20th century, is somehow the result of the incredibly dynamic economic development of this country at the turn of the 19th and 20th century. The most spectacular theory of location developed by A. Weber (1909) and the theory of central places (centres) formulated by W. Christaller (1961), developed and modified in 1944 by A. Loesch (Loesch, 1961), got stuck without continuation, when the development dynamics of the war-devastated Europe weakened.

However, they have become an inspiration for American economists, geographers and regionalists facing the challenges posed by the spatial conditions and implications of the dynamically developing native economy. The works of German location theorists, translated into English in the 1930s, inspired research on the location of individual economic entities and types of economic activities, as well as on the spatial organisation of locally related systems of the same kind and various business entities competing for location and availability of production factors in such a structure (Hoover, 1962).

Undertaking such analyses meant that the theory of location ceased to be treated only formally; its utilitarian potential was noticed, and first of all, used, based on the implied patterns of reasoning and analytical recommendations. Generalising reflections emerging against these analyses, coupled with the knowledge that the theory of location in its original shape was based on neoclassical economics, led to a general theory of spatial planning, which is perfectly exemplified by the study of Walter Isard published in 1956 (Isard, 1965). They also helped to improve the partial balance models for different types of economic activity. They have also become a premise to consider location issues not only within national economic spaces but also, and sometimes primarily, within the framework of the global economic space treated as a kind of a global market for potential locations not perceived as a one-off act but as a process.

This process approach to a location means acceptance of its regulation by adapting the business activity to changing location factors occurring in a given location or searching for new location places offering it competitive conditions that translate into more beneficial economic effects. Thus, the location and thinking about it have become fluid in a post-modern way, and acceptable choices are increasingly becoming suboptimal.

Such a modification of the classical or somewhat traditional approach to the location theory means that the axis organising the academic identity of the researcher analysing the location of economic entities and its economic, spatial, social, institutional and natural implications, and sometimes political, has ceased to be thinking in terms of optimisation requiring searching for the best possible localisation solutions for a given business entity, or assessing them from the point of view of whether they still are.

Acceptable locations are becoming satisfactory because of their level of utility, competitiveness, prospectively assessed economic security and satisfaction resulting not only from the material benefits but also intangible, especially those with axiological provenance and nature. Therefore, optimal solutions are not necessarily sought, but

the set of permissible solutions is accepted, which are within the thresholds set by the subjective level of aspirations and expectations of entrepreneurs, public authorities, local communities, but also location researchers themselves.

This approach effectively facilitates the theory of location, and above all allows clarifying and understanding the existing in practice forms of the issue of the location and locating of economic entities and the microeconomically, locally and regionally significant consequences. It means, on the one hand, a shift in reasoning from the alleged isotropic and homogeneous character of geographical and economic space to perceiving its real heterogeneity and temporal variability, and, on the other, hand replacing the abstract concept of an economic man, the entrepreneur (the decision maker) and the analyst of his locational behaviours, with the concept of a human being with flesh and blood having specific, institutionally determined values (Fierla, Kuciński, 2001).

It also requires perceiving the location not in terms of pointwise understood place but treating it as a particular solution in the locational space generated by a given economic entity, potential or real, not so much a set of places with which the given entity enters or will enter into economic and/or institutional relations, but more a spatial arrangement of various connections, flows, streams and dependencies of this type.

Therefore, it is like the same location theory, but nowadays it is entirely different as to the content and forms of its manifestation. The changing economic reality and the changing approach to taking up and running a business, and perceiving the impact of a specific economic, social, technical, morphological, spatial, institutional and natural characteristics on its closer but also further environment, causes the location theory to evolve, enrich itself and transform, but its essence remains unchanged, and this should be the core of the scientist's identity analysing the location of economic entities in its various aspects and from different points of view. The location analyst who uses this theory heuristically and operationally is, or at least should be, "stuck" in this theory and in the "path of its development". Moreover, his academic identity must be "stuck" in it, regardless of whether he starts the analysis as an economist, economic geographer or a representative of yet another discipline of science.

Location has become an extremely attractive cognitively and pragmatically object of study. Individual disciplines of science attempt to hijack it trying to analyse the location of economic entities, especially its conditions and implications, in their way as a phenomenon and as a process. Not doing so under ontological, epistemological and methodological recommendations resulting from location theory and not treating this theory as the basis of their cognitive actions, they are doomed to intellectual, cognitive and pragmatic defeat, although they may seem to have succeeded.

Summary

Abstract: Looking at how the theory of location has developed and evolved, and how important, not to say critical, element of the academic identity of analysts investigating the location of economic entities is, its determinants and all kinds of implications, influence the perception of the subject of analysis, one can come to a conclusion that this identity is, happens to be, and actually should be not so much complex, but somewhat nomadic. When analysing the location of business entities, its determinants and consequences, it is not about being a geographer and economist at the same time, but depending on the studied aspect of this location, be an economic geographer, or an

economist, sometimes a sociologist, psychologist, urban planner, regionalist or a lawyer, and therefore have a swinging academic identity. Only such an academic identity allows investigating in an interdisciplinary way such complex issues as the question of the location of economic entities undoubtedly is. However, the point is not to be interdisciplinary, based on a crude division of duties not upsetting the academic tribalism. To reach the essence of the complexity of the location, its conditions and implications, it is necessary that the researchers analysing the issue are likeminded. It requires deep intellectual fusion and mental cohabitation of the representatives of various disciplines, for whom the location is an element of the research field, but also those who look at this issue from outside of this field. Moreover, it is not enough to just intellectually flirt, sending each other conventional smiles, or even a kind of kisses suggesting kindness. It is necessary to have a physical closeness that allows the collision of thoughts driving us closer to learning the essence of the complexity of the problem under investigation. Also, there is a need for academic identity pushing the creativity of researchers dealing with a given issue towards the limits of intellectual efficiency, identity accepting the risk of cognitive failure, unrestrained when it comes to breaking the borders created by academic disciplines and institutional structures of science (Jałochowski, 2018). However, to be able to carry out such an analysis in a cognitive and pragmatic sense, one must be aware of the existence and reason of all possible prospects of perceiving the location of economic entities and analysing it, which should be unambiguously oriented but at the same time contextually conducted. The method of conducting this analysis is based on the academic identity of the researchers who are involved in it, but at the same time, this method transforms the identity. Of crucial importance here is the reasoning that determines the researcher's actions resulting from this identity, so much so that they become routine over time, marking his personality and destiny. Our thinking forms and determines how we are perceived by our environment, by our stakeholders, as well as by our social environment. So you have to look at what your academic identity is and whether you have one. It is essential not only because of what and how we do but above all because of who we are and who we are becoming doing scientific studies and research.

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Research Topics of Geography of Enterprise and Decision-Control Functions in Poland against Global Trends

Abstract: The article is a review of the research conducted in Poland on geography of enterprise, understood as a sub-discipline within the scope of socio-economic geography, including research on the behaviour of economic entities, especially large ones, in geographical space. First, the fundamental methodological issues, including terminology, were discussed and then the source query was made. It allowed for identifying about 200 bibliographic items, of which about ten are discussed in detail as the most representative of this research speciality. The results of the study are discussed in two periods: before 1989 and after that date, as the fundamental influence of the political change and the rebirth of the free market economy in Poland after the communist period. In the modern period, three main research trends have been distinguished, referring to global research: transformational-globalisation, localisation (also called organisational-systemic) and behavioural. Moreover, urban research is discussed. In conclusion, geography of enterprise is still too weakly defined in Poland, and it is conducted from the "industry" positions of geography (especially geography of industry), which results from the institutional and organisational assumptions of the Polish socio-economic geography after the methodological conference in Osieczna in 1955.

Keywords: corporate geography; decision-control function; economic control function; geography of enterprise; transformation

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Introduction: geography of enterprise, its methodological foundations and the evolution of research in the world

Geography of enterprise is a subdivision of socio-economic geography dealing with behaviours in the space of business entities. It has a well-established position in the world, related to the fact that in a free market economy enterprises are the primary

subject of broadly understood economic space. Therefore, it is the subject of interest not only of geographers, but also economists, sociologists, political scientists, psychologists, urban planners and other representatives of mainly social sciences. It sometimes results in competence disputes between geography and economics (Czapliński, 2008). They are related in particular to the fact that as part of the organisation and management sciences, in the 20th century, an extensive and recognisable field of research, first described as "economics and/or organisation of enterprises" and then "enterprise science", developed in Poland before the Second World War (Bielski, 1967).

In the Western countries, research in the field of geography of enterprise and decision-control functions was conditioned by the development of industry in the first half of the 20th century. Geography interests in this subject were especially visible in the United States (Hoover, 1937), where the company headquarter was usually a place of activity (production). The beginnings of geography of enterprise were shaped, therefore, by discussing the classic theories of location, first of all of the industry (Krumme, 1969; Hamilton, 1974; Dicken, 2013). It was only in the further period that this field was linked to the services sector and theories concerning the network of centres and settlement hierarchy (Goodwin, 1965; Pred, 1974).

The concept of geography of enterprise in the context of a new research course probably appeared for the first time in 1960 in the work entitled "Towards a more humanistic economic geography: The geography of enterprise" by the quoted above economic geographer Robert B. McNee (1922–1992), associated with the Department of Geography at the University of Cincinnati. The phrase 'geography of the companies' was used in his previous work (McNee, 1958). This earlier paper included analyses of the interaction between companies and their impact on the spatial organisation of economic activity. Particularly keen interest in the subject of geography of enterprise has been noted since the 1970s, when the issues have become more frequently discussed in the literature on economic geography. In addition to studies within the more or less the classic location trend, the subject of decision-control functions, i.e. the issues of location and range of impact of company headquarters, has also developed. It has become one of the most critical issues along with the progress of globalisation, used for instance to identify the settlement hierarchy, including the so-called world cities (Friedmann, 1986; Sassen, 1991; Knox, Taylor, 1995).

There are many interlocking trends associated with corporate research in geography, based on the achievements and methodologies of various social science disciplines, as well as humanities and technical and even natural sciences. It makes this sub-discipline one of the most eclectic not only in human geography but also in a broad spectrum of social sciences. It includes:

- localisation trend, relatively the oldest and associated with research on the selection of the place of activity, including in particular the seats of management, and research on the spatial organisation of economic management and the impact of management centres ('power geography'). Within this trend, research on decision-control functions (management and control) is delimited. This trend, therefore, can be called organisational-functional (Stryjakiewicz, Wajda, 2003);
- behavioural trend, which mainly concerns spatial aspects of making decisions related to the operation of enterprises, such as location, behaviour in space, business profile, organisational and spatial structure, marketing strategy, investment decisions and others;

- transformational-globalisation trend, related to the understanding of the enterprise as the main carrier of economic and, indirectly, social transformation in space at various territorial scales, most often international. It is a relatively recent trend, but currently the most frequent and at the same time the most interdisciplinary one;
- narrower, more specialised directions related to specific aspects of business activity and characteristics of the enterprises themselves, such as size, type of activity, degree of internationalisation, financial flows, specific areas of occurrence (e.g. cities), etc., the most original of which is the so-called financial geography, that is the research on flows and spatial impact of financial institutions ('geography of banks').

Noticeable eclecticism and sometimes even a particular methodological and terminological disruption, including the diversity of conceptual and theoretical approaches and methodologies, resulted not only in the formation, often independently of one another, of separate development paths, but also the use of many possible terms related to geography, enterprise and management. The sub-discipline discussed in this review was most often described as 'geography of enterprise' or 'geography of companies', but also 'corporate geography', 'managerial geography', 'geography of multinationals', 'organisational geography', 'management geography' and others.

However, the location of enterprise geography in the structure of socio-economic geography and the separation of it as a sub-discipline is not apparent. To a large extent, its research scope, both in Poland and in the world, coincides with traditional geography of industry. This applies not only to research methods but also to the approach to the enterprise as the entity organising space. In Polish specialist literature, J. Grzeszczak (1985), T. Stryjakiewicz (1987, 1994) and B. Domański (1997a) pointed it out relatively early. In turn, R. Walker (1989) claimed that enterprises operate within broader spatial structures, hence giving independence to geography of enterprise is pointless. This criticism, however, seems to have a weakness related to the fact that the objects of interest of other industry geographies are also located within more general structures and are subject to their laws.

Since the enterprise is the most important or at least one of the most critical organisational forms in economic space (in addition to households in particular), it would be difficult to imagine the omission of this subject in socio-economic geography. Therefore, the enterprise is the object – directly or implicitly – of various studies on entrepreneurship, regional development, as well as the entire spectrum of partial industry analyses among the areas of geography (of industry, services, trade, transport, etc.). It may be suspected that this is not a lack of research, but certain inertia associated with traditional divisions in socio-economic geography is the reason why Poland's geography of enterprise is not a clear sub-discipline of research, as is the case in countries with well-established free market economy.

RESEARCH IN GEOGRAPHY OF ENTERPRISE IN POLAND BEFORE 1989

The enterprise has been subject to more frequent geographic surveys in Poland since relatively recently. In the years 1945–1989, the country developed in a centrally controlled economy, and therefore the critical decisions were taken by the state. Hence, the industry-related way of perceiving human activity developed, sanctioned by the

conference in Osieczna in 1955 (geography of industry, trade and services, transport, etc.), and subjective approaches (including humanistic and behavioural) were almost absent before 1990. Nevertheless, quite early, as already in the 1960s, a few studies were created, which with all conviction can be classified as falling into the traditional current of the contemporary geography of enterprise.

Polish economic geographers in the first place researched local service ranges in the field of wholesale trade (Eberhardt, Wróbel, 1963). The research was based on the assumption that these ranges were one of the easily obtainable indicators related to the development of regional centres at the level between the voivodeship and poviat. The results of the research were therefore of practical value because they could be included in the work on the territorial reform of the country in 1975. The quoted authors state that in the case of wholesale trade the control function was strongly centralised. The management was the Central Boards of Commerce, mostly located in Warsaw (10 units) and Łódź (5 units). Similar rules were in force for industrial plants. In later studies, R. Guzik and K. Gwosdz (2000) stated that in 1974, the management of the industrial sector was based on the existence of 8 ministries and 74 subordinate organisations. In the conditions of central planning and management, the analysis assumed predominance of Warsaw as a central location for business headquarters, and regional dependencies of the location of headquarters of regional branches were considered.

Over the next 20 years, the issues of development of the control function were practically absent from the subjects of geographic surveys. The only more comprehensive study in the whole country was the study of P. Eberhardt (1986), who repeated the research related to the spatial organisation of enterprises controlling the sphere of supply, distribution and trade. Data from 46 enterprises or institutions with regional branches were collected at that time. It turned out that only 2 out of 46 surveyed enterprises had a territorial organisation coincident with the then administrative division into 49 voivodeships; 11 divided Poland into 17 service regions, referring to the former territorial division. In addition, cities were ranked according to the number of regional branch offices located in them: Warsaw (44), Krakow (41), Wrocław (41), Katowice conurbation (40), Łódź (40), Poznań (39), Szczecin (38), Gdańsk-Gdynia (37), and Lublin (35).

In the 1980s, the first studies on Polish diaspora enterprises appeared, primarily of a documentary and actual value (Manikowska, Matykowski, Stryjakiewicz, 1985; Skalmowski, 1988). However, penetration by global companies was negligible at the time, due to the political and economic determinants, which was also emphasised in international studies (Bornschier, 1982). It was only after the political breakthrough that a comprehensive study on the impact of the power of large industrial plants on the socio-spatial structures and the organisation of space was written (Domański, 1997b, 1998). Industrial control was understood there as an industrialisation policy during the command-and-distribution period.

From the research mentioned above, it can be concluded that while in the 1960s the organisation of control functions was closely related to the administrative structure, in the last decade before the collapse of the command-and-distribution system, this order has significantly eroded. In the analyses cited, it was recognised that the location of the control function proves the attractiveness of a given city as a regional centre and the more management bodies, the higher its rank in the spatial structure of the country.

RESEARCH AFTER 1989

Methodological basis

The political and socio-economic transformation has generated an expected increase in the attention focused on the economic issues in geography. However, the research of enterprises in this discipline – as a force of inertia – were undertaken within the framework of "industries" geography, especially in geography of industry, despite several essential voices about the theoretical-methodological and organisational restructuring of this type of analysis (Chojnicki, 1996; Domański, 1997a).

As mentioned in the introduction, there is a severe methodological difficulty, involving the delineation of the research area, which is the basis for the development of research on the enterprise in a typical geographical sense, distinguishable from non-geographic approaches. One can propose a definition that is closest to the system-organisational and behavioural approach: "geography of enterprise is a sub-discipline or a research speciality within socio-economic geography, which includes the research on the location, impact and organisation of enterprises in space. This approach assumes that geography of enterprise refers to concrete, conscious human decisions. These decisions are based on features related to basic spatial relations, such as distance, direction and typological bond, i.e. the type of relationship (dependence) with the surroundings" (Śleszyński, 2007: 35, modified).

The transformational-globalisation trend

Two fundamental conditions contributed to the popularity of this trend: the political breakthrough of 1989, which was the beginning of socio-economic transformation, and the accumulation of phenomena and processes of economic interdependence, which were strongly connected with this breakthrough, including the collapse of the communist system in the countries of Central and Eastern Europe. It resulted in a natural transfer of the interest in the entire economic geography to the role of spatial transformations and shifts. T. Rachwał (2008, 2015) notes that geography of industry is dominated by the issue of broadly understood restructuring of spatial arrangements in various territorial scales (local, regional, national, global, etc.).

The transformational-globalisation trend is admittedly practised in Poland, but it does not facilitate its identification from the position of the geography of enterprise. The vital monographic studies that deal with the issues of business operations in space have been prepared from the "industry" positions, i.e. in particular, the geography of industry. What should be particularly mentioned is the concept of spatial adaptation of industry in the transformation period (Stryjakiewicz, 1999) (which incidentally remains one of the most original theoretical and conceptual achievements in Polish socio-economic geography after 1989), as well as the explanation of the restructuring of a traditionally industrial region (Tkocz, 2001). In turn, B. Domański (2001) dealt with the factors of locating foreign enterprises and A. Tobolska (2004a) with ownership and organisational transformations in large Polish industrial enterprises.

The transformational-globalisation trend in Polish literature of geography of enterprise is dominant. Relatively most of the studies are published in the series of the

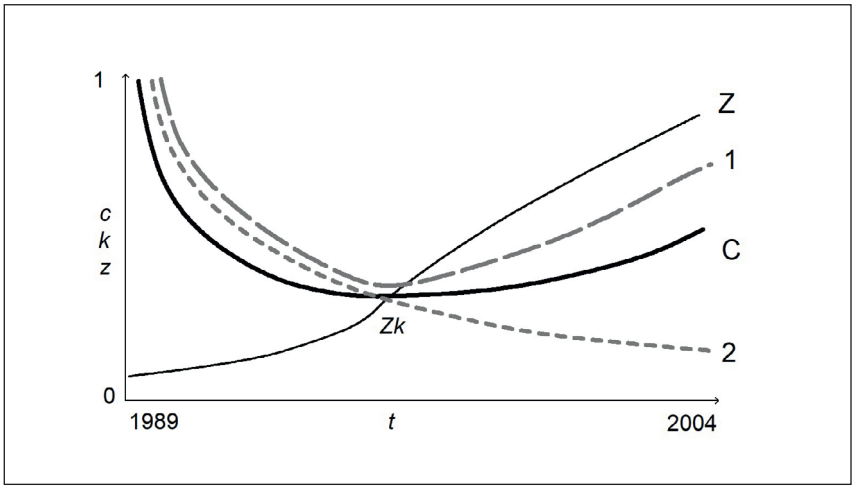
Studies of the Industrial Geography Commission of the Polish Geographical Society edited by Z. Zioło and T. Rachwał and published in Krakow. The studies to be mentioned include, for instance, those of P. Czapliński (2000, 2011), T. Rachwał (2003a, 2003b, 2006a, 2006b, 2013), E. Rydz, W. Szymańska (2003), S. Sala (2003, 2006), M. Niemczak (2008), A. Świdurska (2010), and W. Kilar (2009a, 2014a). The undertaken themes concern both Poland and the whole world or its parts (Zioło, 2001, 2003, 2004, 2006, 2009, 2011; Kilar 2009a, 2014a, 2014b; Raźniak, Nowotnik, 2015; Raźniak, Dorocki, Winiarczyk-Raźniak, 2016; Raźniak, Dorocki, Płaziak, 2017; Dorocki, Raźniak, 2017; Raźniak, Dorocki, Winiarczyk-Raźniak, 2018).

In the group of the transformational-globalisation studies, we can distinguish case studies of particular enterprises, both Polish (Adamczak, 1994; Parysek, 1994; Rochnowski, 1994; Tobolska, 1994; Wypchło, 1994; Rachwał, 2000a, 2000b, 2001; Klimczak, 2004; Kilar, 2006) and operating in Poland (Wilkosz, 2006; Matykowski, Tobolska, 2009; Lizak, 2009; Czapliński, Stawarska, 2010), but also in a European (Kilar, 2014b; Raźniak, Dorocki, Winiarczyk-Raźniak, Płaziak, Szymańska, 2016; Zdanowska, 2017) or global perspective (Wajda, 2003, 2006; Wajda, Zalewska, 2003; Wajda, Zorićić-Wołek, 2003; Kilar, Cieluch, 2008; Kilar, 2009b, 2010, 2011, 2014b, 2015; Bonar, 2011; Boguś, 2011; Lizak, 2012; Wdowicka, 2017). The analyses concern mainly changes in the spatial organisation. There are also several reviews, methodological and concept-model papers on this topic (Smętkowski, 2000; Stryjakiewicz, 2002; Stryjakiewicz, Wajda, 2003; Tobolska, 2006a, 2006b, 2006c, 2010; Gierańczyk, 2008). In spite of the unambiguous sometimes overtones of the title, pointing to the subjective approach to the issues of the enterprise, some of these studies are difficult to explicitly qualify to geography of enterprise, because the analyses presented in them are given from different conceptual, theoretical and methodological positions originating mainly from classical studies of geography of industry, services and tourism (Korcelli-Olejniczak, 2010; Taylor, Ciechański, 2016).

In total, the "industrial" direction in geography of enterprise (or "enterprises" in geography of industry) has proved to be the most popular today. The effect was the development of the concept mentioned above of adaptation of industrial enterprises to new management conditions after 1989 (Stryjakiewicz, 1999). The subsequent, continuation studies carried out in Poznań concern mainly the trend of geography of enterprise, called by the authors "functional and organisational-systemic" (Stryjakiewicz, 2004a; Tobolska, 2004a, 2004b; Tobolska, Matykowski, 2006).

On the other hand, in the discussed transformational-globalisation trend, one should also mention the extensive monograph of P. Śleszyński (2007), in which the accents related to the transformation of enterprises after 1989, as well as changes in their location, are evenly distributed. This paper presents a model of changes in centralisation and spatial concentration of economic control functions (GFK) in the transformation period (1989–2004) (Fig. 1). An important variable in this model is the degree of centralisation, which is introduced to avoid the need to refer to space, and which illustrates the general functional transformations in the economy. In this way, a graph of the dependence of centralisation and spatial concentration is obtained. It turns out that they are convergent until the influx of foreign capital, understood as external control, gained importance.

Fig. 1. Model of changes in spatial centralisation and concentration of economic control functions (GFK) in the period of transformation (1989–2004)



Explanations: *c*, *k*, *z* – the degree of spatial centralisation and concentration, as well as of the inflow of foreign capital (0–1), *t* – time (1989–2004), C – curve depicting the changes in centralisation of economic control functions (GFK), 1 – curve depicting changes in spatial concentration of economic control functions (GFK) in the industrial and financial sectors 2 – curve depicting changes in spatial concentration of economic control functions (GFK) in the retail sector; Z – inflow of the foreign capital, *Zk* – growth in the dynamics of the foreign capital inflow allowing for reaching the 'critical mass' sufficient enough to reverse the co-dependency trend as regards spatial decentralisation and deconcentration of economic control functions (GFK).

Source: Śleszyński (2007)

Location trend and research of economic control functions

Location trend is associated with research of the management headquarters, mainly concerning the settlement network and the functional hierarchy of cities. For this reason, the resulting studies are most often taken by urban geographers, and only then by geographers of industry. After 1989, economists G. Gorzelak (1994) and B. Wyżnikiewicz (1997), first presented the analysis of the location of the headquarters of major enterprises in Poland. Both studies pointed to a significant diversification of economic strength or economic potential in the first years of transformation, including a large concentration of company headquarters in two voivodeships: Warsaw and Katowice, and an increasing spatial polarisation in this respect.

The first "typical" survey undertaken by geographers regarding the location of economic management functions is the study of R. Guzik and K. Gwosdz (2000), which examined the concentration of control functions in industry. The research, which covered about 700 largest enterprises in Poland, showed that the management system in Poland is similar to that in the UK and France, where the control function is concentrated in one central city – the capital. Similar research, but in a dynamic system, was also conducted by H. Rogacki (2004, 2006).

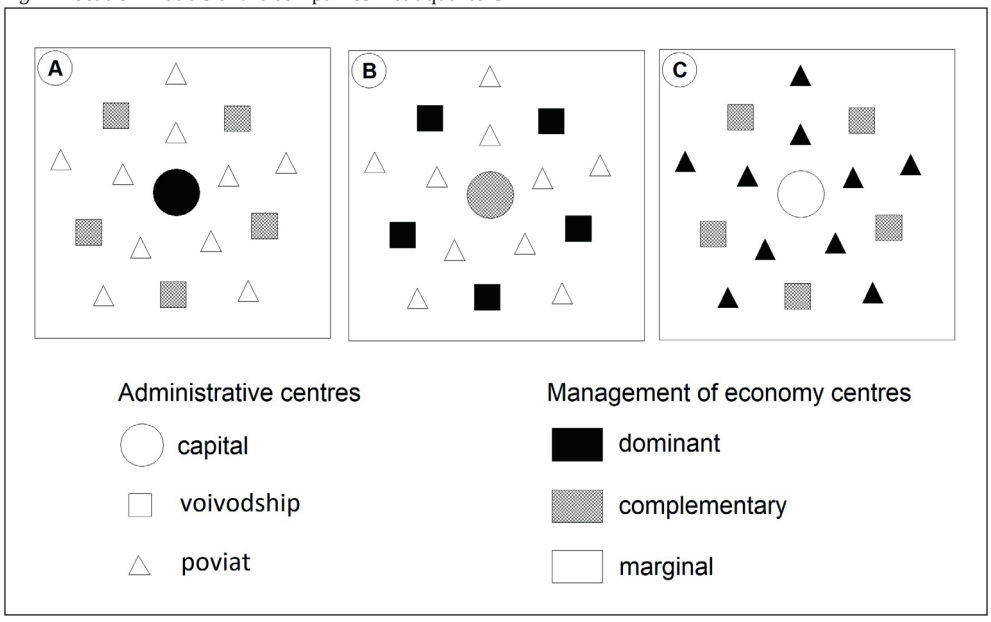
The issues of competitiveness and the rank of large Polish cities in the light of the inflow of foreign capital were developed in the study of B. Domański, R. Guzik, K. Gwosdz (2000), where the urban centres were ranked according to the location of

the headquarters of companies with foreign capital. In the Institute of Geography of the Jagiellonian University, there were also numerous studies on other aspects related to the location of enterprises, including the impact of transnational corporations in Poland on space (Domański, 2000, 2003a, 2005a, 2005b) and the relationship between the region and the economic power of industrial enterprises (Domański, 2003b), as well as more specialised 'sectoral/industry' issues (Guzik, Micek, 2007).

Research in the field of geography of enterprise is also being developed in Warsaw, in the Institute of Geography and Spatial Organisation of the Polish Academy of Sciences. T. Lijewski (2000) presented the analysis of the course of the planned road network concerning the headquarters of the largest Polish companies. Then E. Nowosielska (2001) presented the location of the headquarters of major enterprises in the services sector in the layout of 16 voivodeship in 1999. The issues of geography of enterprise on a national scale were also undertaken in the studies of P. Śleszyński (2002a) and T. Lijewski (2003), where a strong dominance of control functions in the capital centre was demonstrated (the so-called Warsaw hypertrophy), with a tendency to deepen it. In the paper by P. Śleszyński mentioned above, the distribution of control functions relative to settlement centres was also presented (Fig. 2). As a result, three models (schemes) of management were created, depending on the intensity of the occurrence of industry types of the largest companies and their revenues in the capital and other voivodeship and poviat centres.

The study by J. Wendt (2001) presented the spatial structure of power centres in Poland. Featured, among others, were the factors and centres of economic activity for

Fig. 2. Location models of the companies' headquarters



A – with the dominant role of Warsaw (highly specialised services); B – with the dominant role of voivodeship centres excluding Warsaw (low specialised services, partially manufacturing activities); C – with the dominant role of poviat centres excluding voivodeship ones (partially manufacturing services).

Source: Śleszyński (2002a)

which the location of the main headquarter of the largest enterprises, central banks and the territorial structures of selected service networks were important. Similarly, in Poznań, individual, specific types of activities were examined, e.g. banking, a pioneer in Poland in the field of economic geography (Stryjakiewicz, Potrzebowski, 1995; Weltrowska, 2003). In the latter advanced empirical study, among others, the typology of organisational and spatial structures of banks and their networks were presented. Other studies also showed that significant differences in the distribution of spatial economic power and control functions were characteristic of regional arrangements (Śleszyński, 2002b, 2005a, 2005b, 2015; Brambert, 2010).

In the location trend, particular importance was given to the control functions of the centres. Control, as a ubiquitous phenomenon, is one of the attributes of power that enables it to exercise this power. It involves not only its common understanding as checking (obtaining information about) a given state or assessing achievements with intentions, but also observation (monitoring). Hence, in the strict sense of the word, control is a condition or stage that occurs immediately before the decision is made. The economic control function is thus one of the functions of the city, usually exogenous, through which it becomes the organising centre, and therefore subordinating and possibly dominating over the surrounding space (Śleszyński, 2002a). In this way, this function becomes the basis (base) of the node centre in the concept of the economic region. The importance of the economic control function has increased significantly in recent decades along with the growth of enterprises, which are achieving increasing trade volumes. Even around 2010, several of the largest international corporations generated revenues higher than the Polish GDP (Zioło, 2009; Śleszyński, 2013).

The location of the headquarters of the company and the place of its actual operations do not always coincide. It is especially the case of enterprises with numerous branches: enterprises of the financial sector (banking, insurance) and trade and service, and, to a slightly lesser extent, manufacturing. Therefore, the location of enterprises' headquarters does not inform about the actual distribution of manufacturing forces, but only about the distribution of decision centres, i.e. the control function. Thus, we can talk about the location of the discussed headquarters in the context of "management space".

In free market economy, the location of the company's headquarters is therefore essential. One can identify the following roles resulting from the existence of an economic control function in a given locality (Śleszyński, 2002a):

1. economic role, the most complex one, which mainly consists in various contributions to the creation of local GDP and tax discharge, depending on the possession (or not) of non-local branches, subsidiaries, etc. Owning non-local branches is characteristic of, among others, large enterprises in the services sector, especially in banking. The economic role is also participation in investments and the multiplier effect, which in this case is based on the tendency to concentrate activities in the region of the impact of the headquarters of a large enterprise (incl. financial, legal and logistic services, economic consultancy, etc.);
2. social role in which two groups of strictly related issues can be distinguished: arising from economic aspects (e.g. impact on the unemployment rate, migrations related to attracting highly qualified staff) and creating an image by raising the prestige of the city and the region, which directly translates into, for example, investment attractiveness);

3. political role, which often results in the participation of business representatives in local authorities and thus the real impact of the company on local administration and management of the city and the region.

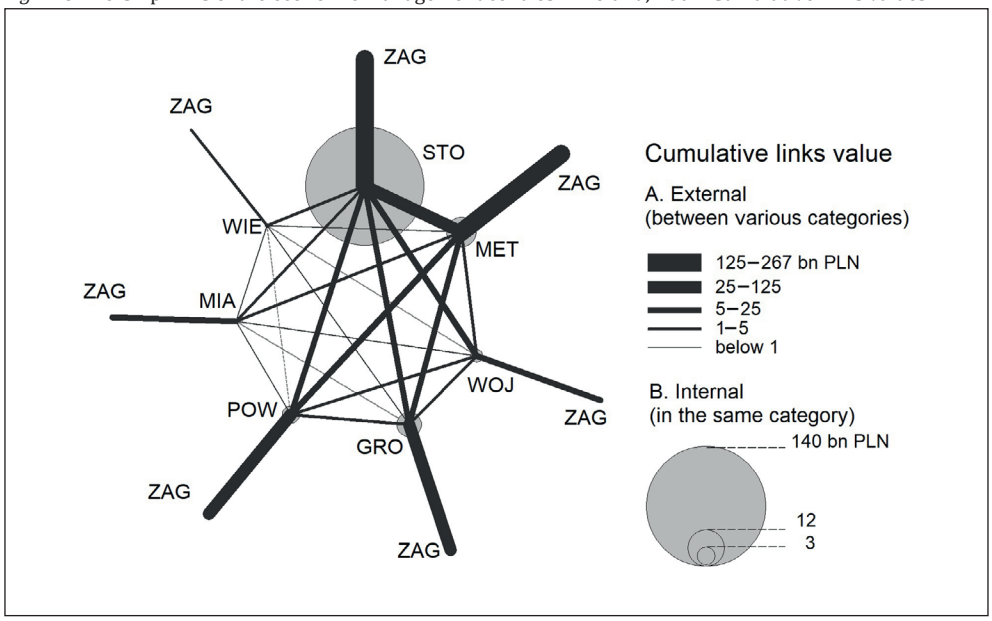
The specificity of the management function consists in exercising control not only over the centres, but, which may be more important from a functional point of view, over the information flow and money circulation. For this reason, financial institutions, especially banks, have the most influential position. In other words, concentrating the management control in one place results in a greater or lesser probability of interaction with another centre, and this depends on the direction of the control function development.

The most comprehensive and best-documented work in this trend is the study of P. Śleszyński (2007) regarding the shaping of economic control functions in Poland, mainly in the period of transformation (1989–2004). The research was based on the then unique revenue and shareholding bases of several thousand of the largest Polish enterprises, collected most often from annual reports or purchased from legally operating business intelligence agencies. Among other things, information was gathered on the capital relations of the largest 1,341 commercial law companies, which were analysed against the settlement structure of Poland and countries that bought shares of these companies, most often as a result of privatisation. For this purpose, the primary indicator of the strength of links was used, based on the volume of turnover and participation in the share capital. It provided the basis for developing models of ownership connections (Fig. 3) and the hypothesis of reducing cohesion and "cracking" or even "breaking" the Polish settlement system by foreign control, which became useful for the needs of the National Spatial Development Concept 2030 (Śleszyński, 2008b).

As for the above concept, it was found that in the international system, economic management centres located in Poland are subordinate in the national system: highly developed Western European countries and (besides) the United States. The main foreign control centres are concentrated in a few spatially small areas, connected in more than half with well-developed largest agglomerations, including the so-called global cities. There is a large selectivity concerning the selection of agglomerations controlling Polish centres, but they generally reflect the structure of economic governance in the owner countries. In Europe, these are primarily Amsterdam, Paris and London, in the United States – New York. In Poland, the capital city centre plays the role of the primary contact point and intermediary for further connections. In the national system, it has a strong dominant position over the entire area of the country. In this sense, referring to the Friedman centre-periphery concept, the other metropolitan centres are semi-peripheries, mainly Tri-City, Poznań, Wrocław, Katowice and Krakow, as well as some poviat towns (Płock, Lubin, and Jastrzębie-Zdrój). Other areas play the role of peripheries and are entirely dependent, primarily on Warsaw and foreign control centres, and to a lesser extent on other metropolitan areas.

However, a definite "break" of ownership bonding systems is that lower-level administrative and settlement centres are more heavily controlled by enterprises located abroad than those located at higher hierarchical levels in the country. This breaking of the existing economic hierarchy additionally confirms the concept of subordination. At the same time, in the international system, economic ties are more network-based, while in the national – polar (based on Warsaw). If we combine both observed types of relationships, we get a dependence system that in some way resembles a hierarchy (quasi-hierarchical system). This kind of connections results from the fact that the

Fig. 3. Ownership links of the economic management centres in Poland, 2004. Cumulative links values



Abbreviations for administrative-settlement categories: ZAG – foreign; STO – capital; MET – other metropolitan centres; WOJ – other voivodeship centres; GRO – other poviat centres with town status; MIA – other towns and cities; WIE – villages.

Source: Śleszyński (2007)

economy in the highly developed countries functions to a large extent in the network system, and Poland is just adapting to this model.

The above analyses were later supplemented with research on the links between the organisational (Śleszyński, 2011) and geopolitical (Śleszyński, 2013) structures. The control function tests were also examined in detail in the transport sector (Taylor, Ciechański, 2010a, 2010b, 2011a, 2011b, 2013a, 2013b, 2013c, 2014, 2015). The analyses showed, among others, the concentration of transport investments in metropolitan regions, explaining such a model of location as their role as sales markets and places with good transport accessibility.

Apart from the research mentioned above, the issue of locating economic activity in new political and economic conditions was often undertaken by economists (Rakowski, 1996; Kuciński, 1998; Głowacka, 2000; Pakulska, 2001). In economists' research, it is worth noting, in particular, the study of A. Cieślik (2005), devoted in large part to the factors determining the location of foreign enterprises in Poland and the choice of management seats. This study was awarded by the Polish Economic Society.

Behavioural trend

The behavioural trend, which is one of the most commonly practised in the world, was practically still absent from Polish geography. The only major work is the already mentioned study by B. Domański (1997b), in which the decisions of large industrial enterprises and their impact on the shaping of socio-economic structures were dealt

with. However, the behavioural or behavioural-decision-making trend is much better developed in economics and management sciences, but research in which any references to geographic conditions would be found is quite sporadic. However, recently in geography there are more and more large, comprehensive works, at least partly in the behavioural trend, in which questions are asked about the causes and motivations of spatial behaviour and decisions (Micek, 2017; Tobolska, 2017). This leads to the conclusion that we can soon except the development of this trend in Polish geography of enterprises.

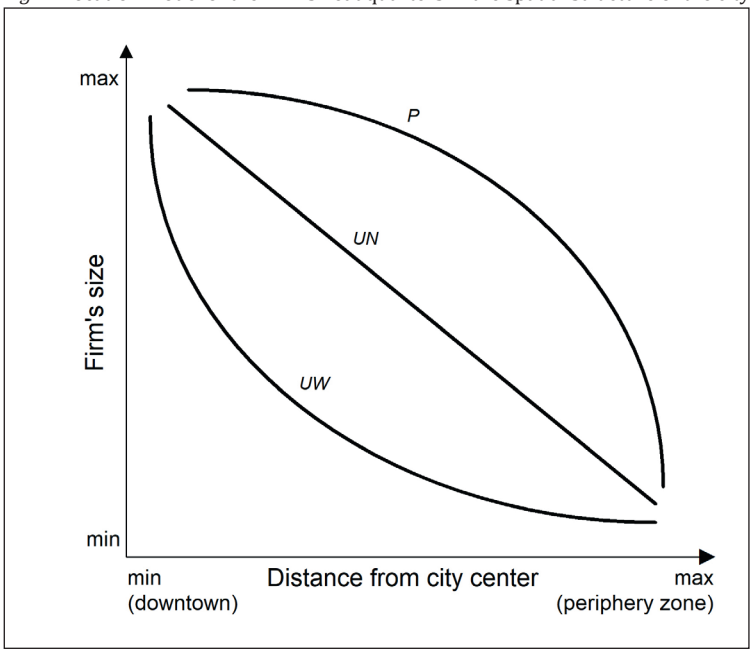
Research of enterprises in urban structures

Investigations of the location and impact of enterprises within cities, well developed in the world, have not been present in Poland so far. Undoubtedly, this is because before 1989 such analyses were limited due to the different political and economic system and the possible lack of impact of the land rent on the location of economic activity. Nowadays, the issue of the location of corporate headquarters is more frequent, but it is not explicitly the main topic of research. The more detailed studies emerging after 1989 usually concerned selected cities, in particular Warsaw (Dziemianowicz, 2000; Rutkowska-Gurak, 2000; Śleszyński, 2002b, 2006, 2014) and Poznań (Tobolska, 2004a, 2014b; Stryjakiewicz, 2009), studies on the impact of individual companies (Stryjakiewicz, 2005), and selected economic sectors or function groups (Wolaniuk, 1997; Misztal, 1998; Wilk, 2001; Śleszyński, 2003; Stryjakiewicz, 2009), as well as transformations of a part of the city (Rutkowska-Gurak, 2000; May, 2001; Śleszyński, 2004), and economic zones (Domański, Gwosdz, 2005), etc. Some of these studies can be classified as part of the "traditional" geography of industry and services, or be placed within urban geography.

The two monographs of the author remain the most comprehensive urban studies (Śleszyński, 2006, 2008a). The former has a mainly documentary value because it contains the most detailed analysis, regarding both space and genre, of the distribution of economic entities in urban space to date in Poland. The latter is a detailed location record of the headquarters in the eight most significant cities of the country. Moreover, it contains the analysis which has allowed to formulate the fundamental regularities of the location distribution (Fig. 4). It states, among others, that spatial concentration is most strongly affected by the largest enterprises, the public sector and more advanced activities, especially higher-level services. They are recorded in the form of regularity – the rules for the location of enterprises in urban areas:

- the principle of size. The larger the enterprise, the more often its headquarters is located in places occupying higher positions in the functional hierarchy, especially in the city centre;
- the principle of operation. The more advanced sector of the economy, the more critical area of the headquarters' location within the functional structure of the city, i.e., as in the case of the largest enterprises, in the city centre.
- the principle of ownership. Capital in its nature (similarities) chooses locations: public closer to the centres of administrative power, private – according to market potential, foreign – indirectly, most often depending on the size and type of activity (see the law of size and activity).

Fig. 4. Location model of the firm's headquarters in the spatial structure of the city



M – manufacturing, LSS – low specialised services, HSS – high specialised services.

Source: Śleszyński (2008a)

The role of the headquarters of large enterprises, as well as their interrelationships, is, therefore, one of the key (probably the most important) in shaping the Central Business District (CBD) in Polish cities during the transformation period (Śleszyński, 2004).

SUMMARY

Geography of enterprise in Poland is the sub-discipline relatively often selected for research, but it is still undetermined and only vaguely shapes its place in the structure of human geography, delineated during the post-war methodological conference in Osieczna. For this reason, it is most strongly associated with traditional geography of industry. At the present stage, the research is growing actively on the ground of localisation and transformational-globalisation trends, while in the least on the behavioural trend. Both earlier trends have been developed within the scope of industrial research and industrial economics, as well as classical or neoclassical location theories, including the theory of central places and the concept of the network of connections ('networking') and rooting of companies ('embeddedness'). The subject matter of the enterprise is inherently more frequent in research on regional development and on socio-economic transformation. Over time, the conceptual and theoretical advancement of geography of enterprise in Poland has been progressing.

The analyses concern both the entire country, as well as smaller regions and individual enterprises, especially industrial ones. There are also more and more studies on the location of companies in urban structures. Geography of enterprise is best

developed in Krakow (Institute of Geography of the Pedagogical University, Institute of Geography and Spatial Management of the Jagiellonian University) and Poznań (Institute of Socio-Economic Geography and Spatial Management of the Adam Mickiewicz University), and also in Warsaw (Institute of Geography and Spatial Organization of the Polish Academy of Science). There are also some "geographical" studies developed by economists (Warsaw School of Economics, Cracow University of Economics, and Poznań). In other centres, studies in geography of enterprise are sporadic. The favourable peculiarity in comparison with other sub-disciplines of socio-economic geography in Poland is the relatively routine undertaking of continental and global issues.

Much more literature has been developed on the subject of geography of enterprises *sensu largo*, that means all geographic surveys the main subject of which is the enterprise. These are, first of all, studies on the development of entrepreneurship, in which usually all companies or all entities of the chosen sector or type of activity are analysed – and not only the largest, having a fundamental impact on the shaping of control functions. It is worth noting that the first studies in this trend appeared very soon after 1989 and concerned an important issue of foreign enterprises (Matykowski, Stryjakiewicz, 1993).

Thus, in Polish socio-economic geography, a separate and distinct sub-discipline of geography of enterprise has not been developed, but it has some original achievements that could add to the world achievements. It should be mentioned above all, includes the adaptive concept of changes in the regional industrial structure, many studies concerning individual enterprises (whose meaning goes far beyond the classically understood case study) and the concept of economic control functions along with localisation models in the spatial structure of the country and large cities.

As far as the research challenges are concerned, it still seems crucial to overcome the industry-oriented, objective way of thinking about human activity in favour of subjective approaches. Then geography of enterprise in Poland may become methodologically similar to the research conducted in Western countries and gain on cognitive and explanatory efficiency. Recently, such a landmark work in Polish socio-economic geography may be a comprehensive study of G. Micek (2017), in which the author dealt with the geographic proximity of enterprises in advanced industry and services and the flow of knowledge. The second extensive work is the study of A. Tobolska (2017), which is currently the most detailed study on the impact of enterprises in Polish area.

It is much easier to identify new research areas, not only those not addressed or scarcely outlined in the review presented, but also the analyses requiring further research using the proposed methodology. Research into business connections seems to be particularly interesting. It applies to both the ownership structure, which is considered in one of the sections here, but also links between the various organisational levels of individual enterprises. Further research is also required into the spatial and temporal scales of the impact of economic control functions, related to the structure of branches, subsidiaries, etc., and their subsequent links with other entities.

Another issue requiring further detail is the role of foreign capital in shaping the spatial diversity of economic control functions. Particularly, further research is required on the attractiveness of individual regions and cities for company headquarters, as a result of which a particular system of economic subordination is created. In particular, concepts derived from the centre and periphery model, such as the economic domination of metropolitan areas (Korcelli-Olejniczak, 2012) may be applied here.

A huge issue is the role of the control function in shaping the spatial network organisation of the economy. The disintegration of hierarchical structures for networking, especially in the international and global context, has been one of the most specific processes in the structure of the world's economic space for two to three decades (Stryjakiewicz, 2001). It is necessary to specify the significance of ownership connections among other types of connections, especially those related to the real capital and information flow. It could lead to a more coherent and comprehensive concept of a control function in spatial and economic systems.

The possibilities of using economic control functions in related issues seem particularly appealing. Research into the distribution of company headquarters and the links between them can be useful not only in explaining the processes of socio-economic transformation, including centralisation and economic decentralisation. The particular application should be made in the studies on the formation of a new settlement structure, especially in urban systems. It would be worth combining these processes with political history after 1989, especially with the policy of individual governments towards privatisation and, in general, the role of large enterprises in the socio-economic life of the country.

The presented proposals are of a general nature and, indeed, do not exhaust the list of available issues. Most of them should undoubtedly be the subject of in-depth empirical studies and deserve extensive monographs. Along with the deepening of knowledge, the analysis of location conditions and functional connections, a more coherent and comprehensive theory of location of management and economic control functions should be created in the conditions of transition from a centrally controlled economy to a free market economy. In total, prospects for geographic studies on geography of enterprise in Poland seem to be promising.

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Strategies of International Companies as a Research Problem of Geography of Enterprise

Abstract: The main goal of the article is to analyse strategies of international enterprises, undertaken in the processes of internationalisation and expansion into foreign markets. Due to the spatial dimension of these processes, the issues related to the strategies of large foreign investors also appear in the research of geography of enterprise. It is since the functioning of international enterprises can be understood as a result of processes arising from a combination of mutual relations between their management strategy and local conditions in their environment, which in turn affects the diverse range of spatial impacts. The presented study focuses on the analysis of strategies adopted at the highest organisational level, i.e. on comprehensive internationalisation strategies, which most synthetically reflect how enterprises operate on foreign markets. Subsequently, the paper presents the model concept of strategic orientations of C.A. Bartlett and S. Ghoshal, which due to the extended spectrum of identification criteria is more operational. Moreover, in the presented concept, the basic dimensions of internationalisation, i.e. the configuration of the organisational structure and the coordination of activities on international markets, indicate a significant geographical dimension of internationalisation processes. The presented conceptual model also points to new possibilities of interpreting the strategy of international enterprises using the I-R paradigm, which may be particularly useful for the research goals realised in the field of the geography of enterprise.

Keywords: geography of enterprise; international enterprises; internationalisation; strategies

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Introduction: justification of the undertaken research and the purpose of the study

For economic geography, modern times are marked by a particular paradox: the processes of decentralisation and flexibility of production increase the importance of small enterprises, and at the same time, in all industrialised countries, there is a wave

of expansion and merger of large international enterprises. The number of the largest transnational corporations – the name used in the statistics on mega-enterprises in the annual UNCTAD reports – increased on a global scale from 37,000 in the early 1990s to over 103,000 in 2010, and the number of their branches, respectively, from 170,000 to 892,000. These facts justify the increase of research interests of various academic disciplines in this group of global economy actors, including socio-economic geography, and in particular one of its trends, i.e. geography of enterprise (corporate geography). This research stream mainly includes analyses of the location, impact and spatial organisation of enterprises, including international ones (cf. e.g. McNee, 1960; Krumme, 1969; Dicken, 1990; Domański, 1997; Clark, Wrigley, 1997; Stryjakiewicz, 1999; Schamp, 2000; Taylor, Asheim, 2001; Maskell, 2001; Bathelt, Glückler, 2003; Tobolska, 2004a, 2013; Jones, 2005; Wieloński, 2005; Yeung, 2006; Śleszyński, 2007). In the research of geography of enterprise, of particular importance are specific spatial features that distinguish large international enterprises, which include the impact on changes in spatial economic structures, mainly through the transfer of their resources to subsidiary companies and in the form of direct foreign investments. Also through their strategies, e.g. in the field of marketing, product offer or contracts, they affect the international division of labour. Besides, foreign expansion is associated with decisions to choose new locations, especially for greenfield investments ("Windows of Locational Opportunity" according to Storper, Walker, 1989: 70, see also Domański, 2002: 198–199), which in turn is the standard issue of location theory. Since the 1990s in Polish literature on geography of enterprise there have been studies on various aspects of the location and operation of international corporations, including in the form of detailed monographic articles on selected corporations (e.g. Stryjakiewicz, Wajda, 2003; Wajda, Zalewska, 2003; Wajda, Zorićić-Wołek, 2003; Stryjakiewicz, 2004; Lizak, 2009; Tkocz, Żydzik, 2010; Bonar, 2011; Kilar, 2011; Boguś, 2012), or analyses regarding corporate expansion in quantitative terms, i.e. in the form of the inflow of foreign direct investments and their directions (incl. Sala, 2005; Tobolska, 2007, 2014; Wojciechowski, 2015), as well as the effects of this expansion, especially in relation to Polish economy (e.g. Stryjakiewicz, 1999; Domański, 2001, 2005, 2011; Hardy, 2002; Gierańczyk, Stańczyk, 2003; Sala, 2003; Brezdeń, 2004, 2006, 2016; Domański, Gwosdz, Huculak, Wiedermann, 2005; Wdowicka, 2005; Matykowski, Tobolska, 2006; 2009; Pavlínek, Domański, Guzik, 2009; Pakulska, 2010; Winter, 2010). A separate group of studies in this field includes the analyses of the location of corporate head offices (Zioło, Piróg, 2002; Rogacki, 2006; Zioło, 2006; Śleszyński, 2007, 2014, 2015; Kilar, 2014, 2015). General models of corporate behaviour were also formulated in the context of other companies and in the context of changes in the Polish industrial space (Zioło, 2003; Tobolska, 2004a, 2004b, 2006). The analysis of the impact of international corporations on local and regional development (e.g. Dziemianowicz, 1997; Stryjakiewicz, 1999, 2004; Domański, 2005; 2011; Sala, 2005, 2008; Kostrubiec, 2006; Wiedermann, 2007; Zioło, 2009; Tobolska, 2010a, 2010b, 2017) are an exciting trend of research. It should be added that many of the papers representing this research trend were published in the academic journals of the Industrial Geography Commission of the Polish Geographical Society, as a record of the research issues of the annual conferences of this Commission held at the Pedagogical University of Cracow.

However, it should be emphasised that contemporary research themes concerning the operation of international enterprises and related internationalisation processes

and international production are mainly conducted on the basis of economic sciences, as well as organisational and management sciences. They focus on the new perspective of the issues related to organisation, strategy, intra-corporate specialisation, as well as learning processes of branches and their innovativeness (cf. e.g. Zorska, 1998, 2007, 2013, 2014; Rymarczyk, 2004, 2012a, 2012b; Yip, 2004; Cieślik, 2005, 2013; Kutschker, Schmid, 2005; Gorynia, 2007; Fonfara, 2009; Stępień, 2009; Rosińska-Bukowska, 2012; Oczkowska, 2013). A particularly interesting research trend concerns shaping of new roles of foreign branches, both for corporate strategy and links with entities operating in the branch's environment (cf. Zorska, 2007: 230–269, 2013, 2014; Stępień, 2009; Ząbkowicz, 2009; Cieślik, 2013; Gorynia, Samelak, 2013; and among foreign studies, e.g. Holm, Malmberg, Sölvell, 2003; Ivarsson, Johnsson, 2003; Phelps, MacKinnon, Stone, Braidford, 2003; Defever, 2006, 2012; Frigant, Layan, 2009; Winter, 2010). Hence the inspiration and concept of the presented study, whose primary goal is to analyse strategies of international enterprises, undertaken in the processes of internationalisation and expansion into foreign markets. Due to the spatial dimension of these processes, issues related to strategies undertaken by enterprises also appear in the research of geography of enterprise (Tobolska, 2017). It should be noted that the scope of influence of subsidiary production plants of large international enterprises in the local and regional space is primarily the result of investors' strategy and related strategic goals, i.e. strengthening of the competitive position. The strategic orientations adopted by the companies related to the internationalisation process of their activities, new ways of organising and functioning on international markets, as well as competitive strategies related to the use of different sources of competitive advantage on foreign markets, result in the shaping of different location orientations of their subsidiaries/branches. In turn, in new locations of the branches new connections and spatial arrangements are created, with a different scope of both economic and social dimensions. In this context, the functioning of multinational enterprises can be understood as the result of a process arising from a combination of mutual relations between their structure and management strategy, and local conditions in the enterprise environment, in a given place and time (see Schamp, 2000: 61). Therefore, it can be assumed that the starting point in the analysis of functioning of international enterprises is the identification of their strategy, which determines the ways and scope of impact of their branches in the local, regional and global space. This approach can, therefore, be considered as a suggestion for researching the problems of international business strategies characteristic of geography of enterprise.

Strategies of international enterprises in the internationalisation process

Decisions on how to function and achieve the set goals are made by enterprises in the form of a strategy, i.e. a specific long-term action plan; in the case of international enterprises, they additionally involve decisions on the ways and directions of their internationalisation. The presented study focuses on the analysis of strategies adopted at the topmost organisational level of these highly developed enterprises, i.e. on comprehensive internationalisation strategies, which in the most synthetic way reflect the ways in which enterprises operate on foreign markets, including the various relationships between organisational units and business partners (cf. Tobolska, 2017). Referring to

the findings of J. Rymarczyk (2012a: 257), it should also be noted that the overall strategy of international enterprises stems mainly from the culturally diverse orientation of these companies, shaped under the influence of the entire complex of conditions under which business is conducted on foreign markets.

In the first stage of the analysis, apart from the review of various theoretical approaches on the issue of strategy in enterprises, the concept of a comprehensive corporate internationalisation strategy is also presented, followed by a model concept for the strategic orientation of C.A. Bartlett and S. Ghoshal (1987a, 1987b), which is more operational in nature. The choice of this model concept has been made mainly due to the relatively broadest spectrum of criteria for identifying the types of quality strategies distinguished by the authors. The most important criterion from the point of view of spatial analysis is the ability to recognise organisational structures that reflect the configuration and connections between branches of corporations, and at the same time characterise their strategy (according to A.D. Chandler, 1962: 13 "Structure follows strategy", cf. Kreikebaum, 1996: 136–138; Tobolska, 2004b: 121; Rymarczyk, 2012: 503).

The starting point in the analysis of comprehensive corporate internationalisation strategies is the assumption that when formulating the strategic orientation of the enterprise, general framework decisions regarding the internationalisation process are made, which reflect a comprehensive picture of the functioning of such an international organisation (*Internationalisierungsgestalt*/*Internationalisierungsmuster*, i.e. a character or pattern of internationalisation, according to Kutschker, Schmid, 2005: 278). They are further developed and refined as part of preparation of development strategies through expansion to particular foreign markets, or competition strategies of individual organisational units in specific markets (cf. Gorynia, 2007: 38; Romanowska, 2009: 22; Pierścionek, 2011: 10, 18–19; Oczkowska, 2013: 156). The decisions of the corporations about the way of entering foreign markets and the selection of competition strategies can be another step in deepening the analysis of international business strategies.

Enterprise strategies – the multiplicity of approaches and definitions

In the classical definition formulated by A.D. Chandler (1962: 10), the strategy is presented as "the process of defining the company's long-term goals and objectives and adopting directions of action, as well as allocating the resources necessary to achieve these goals" (cf. Kreikebaum, 1996: 26–27; Tobolska 2004b: 120; Gorynia, 2007: 30; Oczkowska, 2013: 152). However, the concept of a strategy has evolved significantly along with the changes in economy and management methods, as well as with the increase in the dependence of enterprises on an increasingly turbulent environment. In the new conditions of a strongly globalised economy, the strategy is perceived as a way to achieve a long-term competitive advantage in designated areas of activity (cf. e.g. Zorska, 1998: 146; Koźmiński, 1999: 97; Hatch, 2002: 113; Stabryła, 2006: 17; Fonfara, 2009: 18; Oczkowska, 2013: 153). In the literature on organisation and management theory, in particular in the field of strategic management, a lot of approaches and definitions of the term are presented, and their extensive review can be found in the papers by H. Mintzberg and J.B. Quinn (1991), M.E. Porter (1992), J. Jeżak (1993), K. Obłoja (1993, 2014), H. Kreikebaum (1996), A. Zorska (1998), K. Fonfara, M. Gorynia, E. Najlepszy, J. Schroeder (2000), M.J. Hatch (2002), P. Banaszyk (2002), Z. Pierścionek (2003,

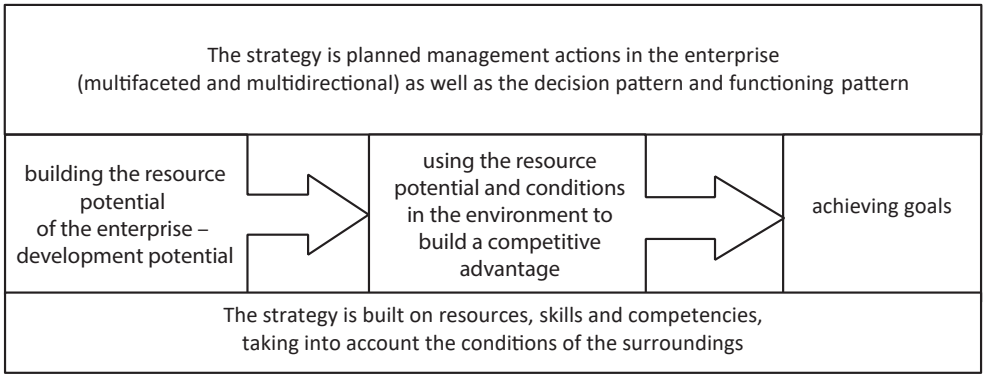
2011), R.W. Griffin (2004), E. Urbanowska-Sojkin, P. Banaszyk, H. Witczak (2004), G.S. Yip (2004), M. Kutschker and S. Schmid (2005), K. Sowa (2006), M. Gorynia (2007), E. Cyrson (2009), M. Romanowska (2009), J. Rymarczyk (2012a), M. Rosińska-Bukowska (2012), A. Tobolska (2017). In these quite diverse descriptions defining the concept of a strategy, however, there are several recurring common features, such as:

- a goal: a strategy is always associated with the formulation and implementation of the goal or "a bundle" of the company's long-term goals;
- a plan: a strategy is based on action planning in a given time horizon;
- resources, skills, competencies: these are the primary sources of a competitive advantage for enterprises; the strategy is mainly being based on them;
- the environment: the strategy reflects the reactions to changes in a turbulent and complex company environment.

Synthetic characteristics of the concept of the strategy are presented in Fig. 1.

There are many types of strategies undertaken in enterprises, which are distinguished depending on the adopted criteria, for instance, the following strategies can be identified due to the direction of the company's development: growth (investment), stabilisation and contraction (disinvestment, cf. e.g. Kreikebaum, 1996: 59). In turn, due to the development of products on the market H.I. Ansoff (1957: 114) distinguished strategies of market penetration, market development, product development, as well as vertical, horizontal and lateral diversification (cf. e.g. Gorynia, 2007: 38–40; Romanowska, 2009: 64–96, Oczkowska, 2013: 155). Its multi-level nature also influences the complexity of the strategy – usually in addition to the overall strategy of the company (corporate strategy), which characterises its mission and vision, as well as the primary goals, strategies are also formulated for individual organisational units or areas of activity (business strategies), and at the lowest hierarchical level of enterprises – partial strategies (functional/operational strategies), which constitute the implementation of a comprehensive strategy in the company's functional areas, e.g. supply, sales, marketing, production, financing, human resources, investments (cf. e.g. Griffin, 2004: 246–247: Kutschker, Schmid, 2005: 797–811; Gorynia, 2007: 44–45; Romanowska, 2009: 22; Rymarczyk, 2004: 74–135, 2012a: 255–500; Oczkowska, 2013: 156). Moreover, Z. Pierścionek (2011: 17, 397–419) additionally distinguishes the level of strategies for the creation and development of the network level, related to the global economy and

Fig. 1. Synthetic characteristics of the strategy in an enterprise



Source: Tobolska (2017: 102)

the knowledge-based economy. Attention should also be paid to the so-called emergent strategies (according to Kutschker, Schmid, 2005: 808; also Griffin, 2004: 248), which are implemented by enterprises in response to the turbulent environment in the global economy and therefore should be seen as reactions to poor predictability of the implementation of strategic plans.

The fundamental distinction between companies' strategies is related to achieving a competitive advantage. In this respect M.E. Porter (2000: 54) distinguishes three base strategies: cost leadership, differentiation and concentration (cf. also Griffin, 2004: 255–256; Rymarczyk, 2004, 2012a: 317–326; Sowa, 2006: 82–91; Gorynia, 2007: 41–45; Romanowska, 2009: 204; Oczkowska, 2013: 180–186). Undertaking competitive strategy is, broadly speaking, the development of existing sources of competitiveness in the enterprise, i.e. resources, skills, structures and other key competencies, as well as creating new ones (Pierścionek, 2003: 275; Sowa, 2006: 79; Kutschker, Schmid, 2005: 798), but also the use of opportunities and evading threats appearing in the environment. Apart from base (Porter's) competitive strategies, other types of them can be found in the literature, e.g. in D. Faulkner and C. Bowman (1996: 28, cf. Sowa, 2006: 87–89; Oczkowska, 2013: 183–186)), or K. Ohmae (1982: 46–48, cf. op. cit.); in addition a whole range of their types and varieties are presented, among others, by Z. Pierścionek (2011: 204–2016) and K. Obłój (2014: 349–380).

Strategies for the internationalisation of enterprises

In the case of international enterprises, the distinguished strategies have their specificity and are usually diversified in individual areas (both functional and market areas), or different strategies are applied simultaneously (mixed strategies – Gorynia, 2007: 37–39). Depending on the criterion and aspect of the analysis, they characterise e.g. changes in the position in the international environment (product development strategy, market development, diversification, vertical upward/downward or lateral integration), or the method of allocating its resources on particular foreign markets (strategy of concentration/centration/specialisation, dispersion/decentralisation, or outsourcing/offshoring). Also, strategies in international enterprises are considered on a multi-level basis (Gorynia, 2007: 39; Oczkowska, 2013: 56; Romanowska, 2009: 22):

- at the level of the entire corporation, the strategic orientation of the company is determined, as well as development strategies, which in the case of large multinationals are multi-faceted (from the market or product development), usually mixed and diversified. The development strategies for international enterprises also include strategies for expansion into foreign markets (detailed characteristics of these strategies can be found in the studies of such authors as e.g. Backhaus, Meyer, 1993; Garrette, Dussauge, 1996; Giese, Mossig, Schröder, 2011; Gorczyńska, 2008; Gorynia, 2007; Kraśniak, 2012; Kutschker, Schmid, 2005; Neumair, Schlesinger, Haas, 2012; Pierścionek, 2011; Puślecki, 2009; Rymarczyk, 2004, 2012a, 2012b; Sowa, 2006; Wąsikiewicz-Rusnak, 2005; Zorska, 1998, 2007).
- at the level of strategic units, competition strategies are defined on particular markets, both in the spatial and product dimensions;
- at the level of functional areas of the entire corporation, formulated strategies may include marketing, HR, research and development, financial, controlling, or risk management strategies.

Due to the way international companies operate, it is worth paying attention to the group of competition strategies, which in this case also have their specificity. J. Rymarczyk (2012b: 321) points out that in the case of international corporations there are changes in the importance of base competition strategies for increasing the flexibility of operation, permanent learning ability, as well as creation of organisational and technical innovations. These complex strategies, according to the cited author, are aimed at adapting enterprises to globalised markets and a knowledge-based economy. In addition, unlike domestic ones, they are based on additional sources of competitive advantages, such as the ability to create international corporate structures and use diverse factors and conditions of production in individual countries or regions of the world (including through practical use of fluctuations in global demand and supply, effective use of exchange rate changes and diversification of tax burdens, as well as economic and customs policy, or through minimising costs and losses resulting from these changes – cf. e.g. Pierścionek, 2011: 35, 152; Sowa, 2006: 82–83; Romanowska, 2009: 111–114). Building a competitive advantage in international corporations is primarily done by locating individual links in the value creation chain on various regional and national markets. This organisational dispersion also allows using large and diverse resources, both tangible and intangible, including strategic, unique skills that allow companies to change their internal configuration towards greater development opportunities permanently, use of critical competencies, knowledge resources and learning, as well as the trademark, patents, known brand or reputation (cf. Kutschker, Schmid, 2005: 806; Sowa, 2006: 75–83; Kulke, 2009: 126). However, the most critical source of the competitive advantage in international corporations seems to be internalisation and the ability to reduce transaction costs – international companies realise internal cross-border flows of enormous scale within their corporate structure, which include streams of investments, technologies, resources, production and sales capacity, components, ready-made products, consultancy, staff, new methods and models (cf. incl. Schamp, 2000; Bathelt, Glückler, 2003: 155; Kulke, 2009: 209; Czupiał, 2011: 53–60; Pierścionek, 2011: 400). Intra-corporate exchange on the international scale is therefore considered by many researchers to be a key factor shaping the competitive position of global enterprises (Sowa, 2006: 82). It is worth emphasising that internalisation has also been reflected in the OLI paradigm of J.H. Dunning in the form of internalisation advantage, while the use of international organisational structures – in the form of a localisation advantage.

In turn, the base competition strategies highlighted by M.E. Porter are difficult to determine on the scale of the entire corporation as it consists of many organisational units dispersed in many markets. Thus, the use of universal sources of the competitive advantage usually focuses on the level of strategic business units and in branches (cf. e.g. Sowa, 2006: 82–91; Gorynia, 2007: 39; Pierścionek, 2011: 18; Oczkowska, 2013: 156). It is also necessary to distinguish between two aspects of the competitive strategy in international enterprises: 1) competition strategies undertaken by subsidiaries on local and regional markets, and 2) strategies at the level of the entire corporation, related to strengthening its competitive position on the international scale, by using local sources of the competitive advantage (localisation advantage) and locating their subsidiaries on foreign markets.

The specialist literature presents quite numerous characteristics of different types of strategies undertaken by multinational enterprises, which can be identified under

the collective term of an internationalisation strategy (cf. e.g. Kutschker, Schmid, 2005: 809–1038; also Stonehouse, Hamill, Campbell, Purdie, 2001: 93–127; Rymarczyk, 2004: 74; Sowa, 2006: 80–89, 98–118; Stabryła, 2006: 16–21; Gorynia, 2007: 37–45; Romanowska, 2009: 103–107; Zakrzewska-Bielawska, 2009: 340; Neumair, Schlesinger, Haas, 2012: 323–385; Oczkowska, 2013: 152–186). Although there are various ways of approaching the issue of the internationalisation strategy, their essence consists in distinguishing those company strategies that relate to activities on foreign markets and involvement in various economic operations with foreign partners in order to gain and maintain a competitive advantage (Rymarczyk, 2004: 74; Stabryła, 2006: 17; Gorynia, 2007: 35; Oczkowska, 2013: 155). Internationalisation strategies thus reflect how enterprises operate in an international environment through the characteristic (specific to the domestic market) ways of shaping their internal structure and functioning on international markets (cf. Urbanowska-Sojkin, 1996: 24; Rymarczyk, 2004: 74). The internationalisation strategy can also be considered as one of the forms of a development strategy of an international enterprise, which follows spatial expansion outside the home country, but also through the diversification of products offered on various foreign markets ("active internationalisation" by Gorynia, 2007: 35; also Fonfara, 2009: 12), or establishing economic relations with foreign economic entities ("passive internationalisation", op. cit.). According to M. Gorynia (op. cit.), at the level of the whole company one can talk about internationalisation when at least one product in the company's portfolio is connected with the foreign market, and in very diverse forms, i.e. from non-capital cooperation, through, for instance, strategic alliances and exports, to independent production abroad.

Undertaking internationalisation strategies, according to M. Kutschker and S. Schmid (2005: 809–810), depends on a certain philosophy and vision of the company's operation and its organisational culture. Therefore, what strategy an international company takes depends on certain values, attitudes, orientations and visions of the future of its owners and management (cf. also Griffin, 2004: 248–249). The quoted authors indicate that decisions regarding the selection of internationalisation strategies stem from some of the original, basic assumptions of the company's operation, which can be identified and recognised on the basis of strategic orientations adopted by them. There are many model concepts that describe strategic orientations; the best known include the multi-stage concept of H. Perlmutter (1969, its detailed presentation can be found in the papers of, for example, M. Kutscher and S. Schmid of 2005: 279–289, also in the studies by J. Rymarczyk of 2004 and 2012, and M. Wdowicka of 2005), as well as a multi-level concept of strategic orientation types of C.A. Bartlett and S. Ghoshal (1987a, 1987b), one-stage concepts (after Kutschker, Schmid, 2005: 279–289): "heterarchy" by G. Hedlund (1986), "diversified multinational corporation" by C.K. Prahalad and Y.L. Doz (1991), and "horizontal organisation" by R.E. White and T.A. Poynter (1989). Therefore, it can be assumed that strategic orientations reflect a certain general pattern of internationalisation (*Internationalisierungsmuster*, according to Kutschker, Schmid, 2005: 278; see also Gorynia, 2007: 37; Urbanowska-Sojkin, 1996; Oczkowska, 2013), and thus the primary and basic internationalisation strategy at the level of the entire corporation. In the case of large international corporations with extensive organisational and spatial structures, it becomes an important issue to define their overall strategies (corporate strategies or basic strategies, cf. Stabryła, 2006: 54–55; Gorynia, 2007: 37), related to the undertaken internationalisation processes, both through expansion into foreign

markets and through their involvement in various business operations with foreign partners. Other types of strategies (e.g. business unit strategies, competition strategies, functional strategies) can be considered as lower-level strategies that are usually strongly diversified at the level of the entire corporation and concern only selected areas or functional levels, thus they do not characterise the overall internationalisation strategy of a big and diversified international enterprise.

Strategic orientations of international enterprises – the model approach of C.A. Bartlett and S. Ghoshal

In the multistage concept of C.A. Bartlett and S. Ghoshal (1987a, 1987b) the authors distinguish four types of strategic orientation: international, multinational, global, and transnational (see also: Zorska, 1998: 155–180; Kutschker, Schmid, 2005: 290; Sowa, 2006: 92–98; Tobolska, 2006: 126–130; Rymarczyk, 2012b: 527–536; Neumair, Schlesinger, Haas, 2012: 307–310; Oczkowska, 2013: 161–169; Dicken, 2015: 138–140). Each of the mentioned types of strategic orientations represents different ways of managing, configuring the organisational structure, the role of foreign branches and the scope of their coordination and integration of activities, the degree of centralisation, the scope of key skills and competencies in individual organisational units, and the importance of organisational culture in building the company's identity (see Tab. 1). The distinguished features, mainly of a qualitative nature, are to facilitate the recognition of the internationalisation level of an international enterprise: from the weakest in the case of strategic international orientations, to the strongest in the case of transnational strategies. The concept of C.A. Bartlett and S. Ghoshal is therefore a qualitative approach to enterprise internationalisation processes and is based on an in-depth analysis and understanding of the main aspects of management – formulating strategies, shaping the organisational structure, coordinating activities and the characteristics of the entire organisation. As indicated earlier, the four presented model strategic orientations can be used to identify comprehensive internationalisation strategies for international enterprises. a detailed description of each type of strategic orientation was presented by such authors as, for example, Zorska (1998), Stonehouse, Hamill, Campbell, Purdie (2001), Kutschker, Schmid (2005), Sowa (2006), Gorynia (2007), Neumair, Schlesinger, Haas (2012), Rymarczyk (2012b), Oczkowska (2013), Dicken (2015), Tobolska (2017). At this point it should also be noted that the term "strategic orientations" is used interchangeably with such terms as "strategies of transborder competition" (Sowa, 2006: 92), "competition strategies of supranational corporations" (Pierścionek, 2011: 354, 370), "strategic orientations of internationalisation and globalisation of enterprises" (Rymarczyk, 2012b: 262–264), "organisation models/forms/types of international enterprises" (Neumair, Schlesinger, Haas, 2012: 307–309; Dicken, 2015: 138–141), "figures/patterns of internationalisation of enterprise" or "archetypes of organisations" (Kutschker, Schmid, 2005: 278 et seq.), as well as "supranational/transborder corporate strategies" (Zorska, 1998: 155–164; Zorska, 2002: 95–109). In the present study the term "strategic orientations" is used. It is treated as a synonym of comprehensive internationalisation strategies of international enterprises, whose synthetic characteristics are presented in Tab. 1.

Tab. 1. Types of strategic orientations of companies operating on international markets (according to the concept of C.A. Bartlett and S. Ghoshal)

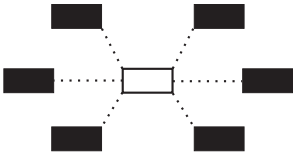
Type of strategic orientation	International	Multinational	Global	Transnational
The original aspect of type distinction	Transfer of mother technologies to other markets and their local responsiveness	Diversification of services/products corresponding to the requirements of local markets	Cost-effective and export-oriented competitive position	Diversity, standardisation and transfer
Key competencies	Ability to innovate and transfer knowledge	Ability to react to local differences	Ability to integrate activities on a global scale	Ability to innovate and integrate
Development and knowledge diffusion	Creating knowledge in the head office and its transfer to branches abroad	Creating and providing knowledge in every organisational unit	Creating and providing knowledge in the head office	Joint development and use of knowledge
Role of foreign branches	Adjusting and applying competencies from the head office	Recognition and use of local market opportunities	Transfer of strategies from the head office	Diversified participation of local units (e.g. strategic leaders) in integrated global operations
Configuration of values and skills	Key competencies centralised, others decentralised	Decentralised and independent within countries	Centralised and oriented to the global market	Distributed, interdependent and specialised
Configuration and coordination of activities (cf. Fig. 3.3)	Coordinated federation, completion, extension of the head office's activities (b)	Decentralised federation (a)	Centralised node structure - branches as supply channels to foreign markets (c)	Integrated network- branches in the integrated system, functional heterarchy (d)
Structure diversity	Divisional (product/ geographical)	Geographical (regions, countries)	Global (groups of products)	Matrix (groups of products/countries, regions)
Connections/ flows	Mainly unidirectional (resources, information, goods)	Unidirectional (resources, supply)	Unidirectional (resources, information, goods)	Multidirectional (network-related, resources, information, goods)
Organisation culture	Quite important	Not very important	Important	Very important
Base strategy	Product-diversified	Diversified geographically	Cost-related	Comprehensive: geographically and product diverse and cost-related

Source: own work based on Bartlett, Ghoshal (1987a, 1987b), Zorska (1998), Kutschker, Schmid (2005: 289–298, 1034–1036), Neumair, Schlesinger, Haas (2012: 307–309), also Tobolska (2017: 112)

It should be emphasised that in the presented concept of C.A. Bartlett and S. Ghoshal, the basic dimensions of internationalisation, i.e. the configuration of the organisational structure and the coordination of activities on international markets, also indicate the critical geographical dimension of internationalisation processes. It is, in the first place, that the spatial differentiation of the location of organisational units (configuration) determines the degree of internationalisation of the enterprise, and thus belongs

Fig. 2. Models of coordination and configuration of international enterprises by adopted strategic orientation (according to the concept of C.A. Bartlett and S. Ghoshal)

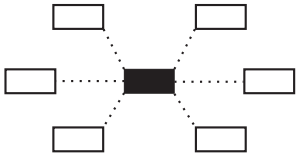
a) Decentralised federation/"multinational organisation" model



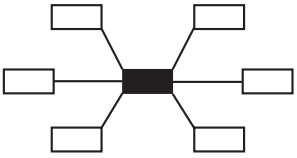
■ Numerous values, resources, decisions and responsibilities are decentralised	configuration-structure
■ Loose, simple mechanisms of financial and personal control overlap with informal relations between the head office and the branches ■ Main financial flows – capital (outflow) and dividents (inflows)	administrative control and flows
■ Multinational mentality: the management perceives foreign branches as a portfolio of independent companies	attitude to foreign activity

b) Coordinated federation/"international organisation" model

configuration-structure	■ Many of the values, resources, decisions and responsibilities are decentralised but coordinated by the parent company
administrative control and flows	■ Formal control and planning mechanisms conducted by the management of the corporation enable tight relationships between the parent company and its branches ■ Mainly knowledge, technology, products, processes and systems flows
attitude to foreign activity	■ International mentality: the management perceives foreign branches as "satellites" of the parent company



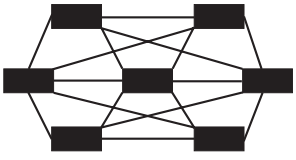
c) Centralised, node structure/"global organisation" model



■ The parent company is a node most of the strategic values, resources, decisions and responsibilities are centralised	configuration-structure
■ Simple control mechanisms centrally taken strategic decisions, control of operation, decisions, resources and information ■ Mainly flows of goods	administrative control and flows
■ Global mentality: the management perceives foreign branches as supply channels of the unified global market	attitude to foreign activity

d) Integrated network model/"transnational organisation" model

configuration-structure	■ Dispersion of specialist resources, skills, decisions and responsibilities
administrative control and flows	■ Complex processes of cooperation and coordination when making joint decisions
attitude to foreign activity	■ Integrated network of interdependent units involved in significant components, products, resources and information flows



Source: own work based on Stonehouse, Hamill, Campbell, Purdie (2001: 257), Kutschker, Schmid (2005: 292, 1035), Rymarczyk (2012b: 527–530), Dicken (2015: 138–139)

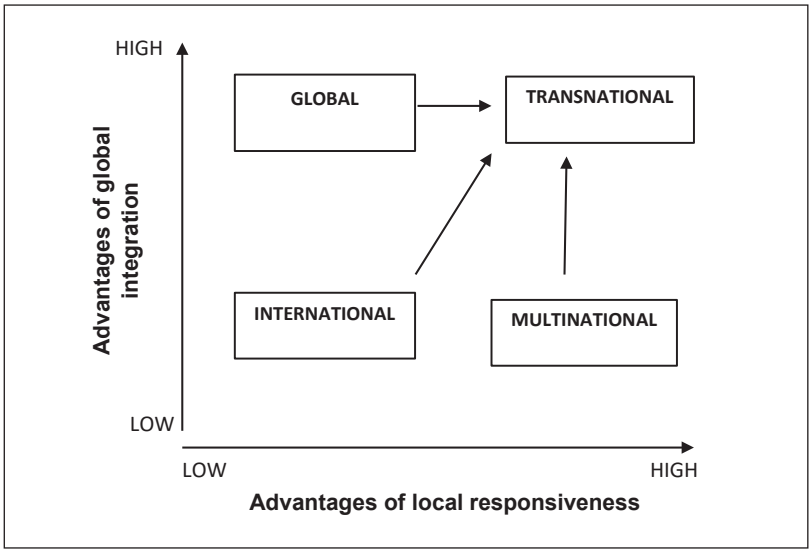
to one of the distinct types of strategic orientations. The configuration dimension refers to the degree of scattering or spatial concentration of individual, organisational units that are the links of the value-added chain in international companies (Kutschker, Schmid, 2005: 970; also Stonehouse, Hamill, Campbell, Purdie, 2001: 45). In this dimension, locating various activities in different places depends on the possibility of gaining a competitive advantage that individual locations offer, and consequently depends on the location factors. In turn, the coordination dimension indicates the scope of mutual adjustment and harmonisation of spatially distributed functions, located in many countries, to gain a competitive advantage. According to Stonehouse, Hamill, Campbell, Purdie (2001: 45) "coordination includes information sharing, responsibility in allocation and organisation of activities". In the concept presented, the authors distinguish four different coordination models, which they attribute to four strategic orientations:

- coordinated federation in international enterprises,
- decentralised federation in multinational enterprises,
- centralised node structure in global enterprises,
- integrated network structure in transnational enterprises.

The distinguished models indicate differentiated relations between organisational units depending on the degree of centralisation and control of decisions, and the flow of resources, which are graphically presented in Fig. 2.

Characterising the "archetypes" of international enterprises of C.A. Bartlett and S. Ghoshal, attention should also be paid to a slightly different perspective of their analysis in two profiles at the same time: on the one hand, due to the benefits of global integration and standardisation, and on the other due to the benefits of adapting to local market conditions. These are two independent dimensions that differentiate the distinguished archetypes of enterprises, which can be expressed in the form of a dichotomous arrangement, shown in Fig. 3.

Fig. 3. Advantages of global integration and local responsiveness in strategic orientations of international enterprises



Source: Tobolska (2017: 115)

J. Fayerweather described these two multidirectional aspects of the functioning of international enterprises (1969, after Neumair, Schlesinger, Haas, 2012: 305–307). At the end of the 1960s he proposed a two-dimensional analysis in the area of the impact of two strong tendencies – global integration and local responsiveness. This concept is known in the theory of international management as the so-called I-R paradigm (integration-reaction paradigm), which describes the fundamental management problem in international enterprises, concerning the conflicting requirements between global integration and adaptation to local needs and markets (op. cit). According to the cited authors, there are no unambiguous interpretations of both dimensions, and there are several variants of using the I-R paradigm to describe directly observed facts from the activities of international enterprises. However, in general terms, the integration dimension indicates the degree of demand for a global strategy or integrated business system, while the reactivity dimension (reactiveness, adaptation) describes the degree of reflection of conditions specific to a given economic space in the activities of international enterprises, in particular in the form of applied international marketing tools and adapting the product offer.

P. Dicken also presents analogous relationships (Dicken, 1998: 207, 2015: 129) based on the development of C.K. Prahalad and Y.L. Doz from 1987, as well as A. Zorska (1998: 90–91, 155–156; see also Romanowska, 2009: 105; Pierścionek, 2011: 371) based on the findings of Ch. Hill and G.R. Jones from 1995. In this approach, the type of transborder strategies depends on the relationship between the pressure to reduce unit costs of products and the pressure to adapt products to the needs of local/national markets. International corporations have great opportunities to reduce costs by locating their functions in optimal economic conditions, offered by various national markets, as well as by increasing scale, specialisation and standardisation – including these aspects characterise the benefits of global integration of spatially dispersed production and organisational functions. Cost reduction must be accompanied by the growing integration of activities carried out by various corporate entities operating in many countries. At the same time, some functions must be adapted to the capabilities and needs of local markets. The local adjustment also involves foreign subsidiaries taking decisions in the field of resource management, in response to the needs of buyers and the requirements of the competitive situation on the domestic market (after Zorska, 1998: 91).

It seems that the research perspective described in the I-R paradigm is particularly useful for research objectives realised in the field of geography of enterprise.

SUMMARY

Summarising considerations on the strategy of international enterprises, it should be noted that this is a very complex and multithreaded issue. It applies to very different ways of classifying strategies, and different areas and levels of enterprises. Moreover, many approaches represent different research trends (e.g. strategic management, internationalisation and globalisation of enterprises, international business and foreign expansion, enterprise competitiveness, as well as geography of enterprise). An additional difficulty is also posed by the interpretation and definition of individual terms, because researchers addressing these issues accentuate different views of the issues presented. Depending on the purpose of study, the same issues are often discussed under different names (for example, the forms of expansion into foreign markets are presented

as "entry strategies on the foreign market" in the studies of J. Rymarczyk (2012a) and A. Zorska (1998), as "market service strategies" according to G. Stonehouse, J. Hamill, D. Campbell, T. Purdie (2001), as "expansion strategies of transnational corporations" according to K. Sowa (2006), or as "forms of entry of enterprises into foreign markets" according to R. Oczkowska (2013).

The issue of international business strategy considered in the study, taking into account their spatial aspects, makes it possible to see the fundamental problems of economic geography, including its current of geography of enterprise, in the new context of innovation, competition and the global network economy. It also seems to be an essential step in explaining phenomena and processes of the socio-economic development, their spatial diversity and interdependence.

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Corporations as an Object of Research in Geography of Industry

Abstract: Today, corporations play an important role in the global, national and local economy. Regardless of the business profile, degree of internationalisation or size, they participate in numerous economic processes, which is why they are the subject of research in geography of industry, especially in geography of enterprises. The main goal of the article is to review research related to corporations in Polish literature on the subject in the field of geography of industry. The author also aims at organising the concept of corporations, presenting closer their classifications, as well as indicating the place of research on corporations in geography. The preparation of the article began with a literature query, as well as an analysis of the existing data (desk research). As a result, the analysis of the concept of a corporation, various types of classifications and divisions of corporations, as well as a literature review of the subject in terms of the corporation's research issues were made. As the research carried out indicates, in Polish literature on the issues of geography of industry, the researchers who concentrate on corporations look at the concentration of their head offices, theory and location factors, shaping processes and location of production, service and various branches, network connections, strategies implemented by corporations and their organisational forms, processes of corporation influence on international conditions for the development of domestic and regional systems and industrial enterprises, stimulation of inflow of foreign direct investment, the influence of corporations on the shaping of various industrial sectors, export relations, the role of cities in globalisation processes and the location of the corporation and their effects, as well as on corporate CSR activities.

Keywords: corporation; geography of enterprise; geography of industry; international company

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Introduction

Corporations, due to their significant potential, are an important driving force in global economy. Other factors affecting their growing role are primarily capital held, management by highly qualified managerial groups, own dynamic research and development centres, as well as various branches.

Corporations, regardless of the profile of their activities, have an indirect and direct impact on the society of almost every country. Therefore, among other entities in the economy, corporations are the theme of study of many sciences, including geography.

The main goal of the article is to review the research related to corporations in Polish literature on the subject in the field of geography of industry. The author discusses the concept of a corporation, analyses the classification of corporations, and aims to indicate the place of research on corporations in geographical surveys.

Research work was based on basic methods, i.e. query and analysis of the subject literature, as well as analysis of existing data (desk research).

THE CONCEPT OF A CORPORATION

The growing interest in the activities of large enterprises operating internationally was most significant in the 1970s. In the literature on the subject, transnational corporations are most often treated as enterprises, companies, international firms, multinational firms, or transnational firms.

One of the earliest definitions of a corporation, as indicated by A. Zorska (2007: 123), was formulated by P.J. Buckley and M. Casson (1976). The authors assume that it is an enterprise that owns and controls operations in various countries. Discussing the various types of market distortions and transaction costs, they point to the only effective way to mitigate their effects by establishing common ownership and control of corporations over activities abroad. The attribute of a corporation is, therefore, the ability to bypass market distortions and reduce transaction costs of operations by internationalising activities carried out in its own structure in different countries.

In 1974, the UN report entitled "The Impact of Multinational Corporations on Development and International Relations", regarding the impact of these entities' activities on development and international relations, multinational corporations are defined as enterprises who own or have control over production or service units located outside the country of the head office. It is recognised that "these enterprises may be companies or units with private capital, but also mixed or state capital" (after Jarczewska-Romaniuk, 2004: 18).

Since the 1970s, the activities of these large enterprises have been an important subject of the United Nations Conference for Trade and Development (UNCTAD). The result of this organisation's activities are annual reports (WIR – World Investment Report, 2005, 2006), which have adopted the concept of a transnational corporation, defined as "an enterprise being a joint-stock company or other business entity consisting of a parent enterprise (with control over at least 10% of shares or other shares over economic units located outside its country of origin) and foreign enterprises affiliated to it, which include: subsidiaries, in which 50% of shares or other resources are controlled by a parent undertaking; affiliates, 10 to 50%, respectively; and branches, wholly under the control of the parent company, 100% of shares" (World Investment Report, 2001: 275).

In parallel with the work carried out by the UN, the issues of the corporation's activities were taken up by the Organization for Economic Cooperation and Development (OECD). In 1974, in the Declaration on International Investments and Multinational Enterprises, multinational enterprises were defined as: "companies or other entities with private, state or mixed capital located in different countries and interrelated in such a way that each separately or jointly can exert a significant influence on the activities of

others, in particular, share knowledge and resources with them" (after Jarczewska-Romaniuk, 2004: 19).

E. Czarny (Czarny, Kleinert, 2004: 234–235) emphasises that one of the manifestations of internationalisation of economic processes is the expansion of multinational enterprises. He defines them as: "companies owning enterprises or controlling economic activity in more than one country".

A. Zorska (2007) explains that there are two names in English literature at the same time: multinational enterprises (MNEs) or multinationals, and transnational corporations (TNCs), assuming that transnational corporations are enterprises operating across national borders. Finally, A. Zorska (2007: 10) adopts the concept of transnational corporations (TNCs) after the United Nations, defining them as "enterprises whose activity permeates national borders and is organised, integrated and coordinated by the head office in the home country".

J.H. Dunning, who from the mid-1970s conducted his research on corporate issues in the United States and mainly focused on corporate operations in foreign direct investment (FDI), defines that a corporation is an enterprise that engages in foreign direct investment and owns and controls the activity of units creating added value in more than one country (after Zorska, 2007: 123).

A. Zorska (2002: 50), after J.H. Dunning (1993), emphasises that the main and unique feature of corporations is their involvement in international production in other countries and trading in intermediate goods (creating this production) on the markets of these countries, within their own organisational structures.

P. Dicken (1992) formulates the definition of a transnational corporation, in which he points out that it is an organisation that coordinates and controls operational activities in more than one country, even if the resources are not its property (Jarczewska-Romaniuk, 2004: 20). He believes that its own specialised value-creating activities are complemented by contracted activities carried out by external, independent companies located in different countries. In connection with this, cross-border networks of internal and external relations are created, which are driven by the ability to integrate and coordinate geographically and organisationally dispersed activities by corporations. P. Dicken emphasises that a corporation making decisions from one centre creates the added value of different units in different countries. The centre is usually the head office of the parent corporation, although in the case of the largest corporations some of the competencies are transferred to regional offices that oversee the activities of more regions (Zorska, 1998, 2007).

Therefore, the author, for the purpose of this study, adopts the concept of a corporation by P. Dicken, considering that it is one of the most complete definitions. At the same time, it confirms A. Zorska's view that transnational corporations are currently the most powerful and most thriving organisations in the world (Zorska, 1998, 2002, 2007).

The problem of defining corporations is widely analysed in the literature, in which the concept of corporations is understood in a similar way. The word "corporation" in Polish law distinguishes a company that is a "joint stock company", but in the national literature, adjectives specifying a corporation, e.g. transnational, global, are usually used interchangeably. Therefore, it seems particularly important to approximate the classification of corporations used in the literature on the subject, delimited due to different criteria of division.

DELIMITATION OF CORPORATIONS IN THE LITERATURE OF THE SUBJECT

The subject matter of corporations in the specialist literature also includes delimitation of corporations and adopts various criteria. In addition to the delimitation based on the subject of the business, which distinguishes the following corporations: production (manufacturing and processing sector), service (trade, finance, insurance and others) and diversified activities (conducting their activities simultaneously in many industries, e.g. General Electric corporation), the classification which is often referred to and which deserves special attention, takes as a criterion the degree of internationalisation and the structure of the corporation.

Division of corporations due to the degree of internationalisation

Internationalisation is a complex process that J. Kukułka (2000) defines as a continuous and ascending process of internationalisation, i.e. going beyond the national borders of various elements of economy, politics, culture, science, technology, information, services, sport, entertainment, and customs. In economic sense, it is understood as a kind of economic activity undertaken by a company abroad, but it has a phase character, and subsequent phases may or may not occur. Considering, as a criterion for the division of corporations, the degree of internationalisation, the literature includes different divisions of corporations. In general, the successive stages which a given enterprise enters, by internationalising its operations, constitute types of corporations in the classifications. R. Griffin (1998) and H. Towarnicka (1997) attempted to systematise corporations by adopting this criterion. R. Griffin divides enterprises into national, international, multinational, and global, while H. Towarnicka distinguishes national, export, international, multinational, transnational, and supranational. The key role in classifying a company to the category is played by the organisation and management model adopted by them.

A. Jarczewska-Romaniuk (2004) analyses adjectives specifying corporations in terms of internationalisation. She assumes that international corporations are those that operate in different countries (nations) and have representatives in many countries; transnational corporations concern all countries (nations) and are superior to all nations; while international and multinational terms are, according to her, synonymous. The term 'transnational' is understood by the author as a company operating across national borders, and their activity based on a constant and conscious undertaking of actions going beyond national borders and establishing wide international contacts, thus exerting an influence on international relations.

W. Gierańczyk and A. Stańczyk (2003) recognise that if the company's assets are located in at least two countries, the corporation will be called 'international'. The authors emphasise that internationalisation can be measured by the percentage of sales for export, the share of foreign workforce employed abroad, in the value of assets abroad, the share of foreign production in total production or the profit generated from foreign operations. By accepting these criteria, the authors, after J. Czupiał (1997), divide corporations, similarly to H. Towarnicka, into international, multinational, transnational, and supranational (global) and made their detailed characterisation (Tab. 1).

Tab. 1. Corporations by level of internationalisation

Corporation type	Share of exports in total sales	Share of foreign production in total production	Share of property abroad	Profit arose from foreign operations	Forms of activity
International	clearly visible, however, domestic sales prevail	significant, but lower than the share of exports	small	similar to the share of exports	having foreign branches that operate on the principle of integrated economic activities
Multinational	reaches or slightly exceeds 50%	similar to the export share	higher than above, but still lower than the share of exports	equal to or higher than the share of exports in sales	numerous foreign entities reporting to the emerging managing sub-sectors, development centres, research laboratories, privileged personnel policy, taking over the parent country patterns
Transnational	outperforms domestic sales	it exceeds the national one	equal to or higher than national	higher than the share of exports	overcoming national limitations, there is no preference for a culture, policy or economy of one country, the management staff comes from different countries often according to strict national standards
Supranational (global)	clearly dominates	the share clearly exceeds domestic sales	clearly higher than domestic, strongly dispersed in different countries	higher than the share of exports	the dominant position on the market of a given product on a global scale

Source: Gierańczyk, Stańczyk (2003: 74), Tobolska (2006a: 50) after Czupiał (1997: 58)

In the literature on the subject, some authors use the UNCTAD transnationality index, calculated as the arithmetic mean of three factors: transnationalisation of assets (value of foreign assets to the value of all assets), sales (quotient of the value of foreign sales to the total value of sales) and employment (the ratio of the number of employees abroad to general employment). The ratio is expressed as a percentage, and its values range from 0 to 100%, with values close to 100% indicating the huge scale of foreign involvement of a given corporation (World Investment Report, 2001; Jarczewska-Romaniuk, 2004; Marzęda, 2007). Due to the degree of internationalisation of activity measured by the transnationalisation index, we distinguish corporations with high internationalisation rate (significantly dependent on foreign activity, most of the enterprise's operations are carried out outside the country of origin) and low rate (low dependence on foreign activity, most of the company's activities are carried out in the country of origin) (Jarczewska-Romaniuk, 2004: 83). Most often, this indicator is used for analyses of the activities of production corporations, but no such assessment has been made for financial corporations, e.g. banks (Tobolska, Matykowski, 2006).

Division due to the corporate structure

Due to the corporate development process resulting from establishing branches in various countries, the following are distinguished:

- vertical corporations, in which production is divided into stages located in different places (countries) in order to minimise costs; corporations of this type often make direct investments in developing countries,
- horizontal corporations, which are multi-plant companies that develop similar activities in different places, while maintaining uniform control over multiple production units; subsequent corporations start to develop when benefits arise from the location of production in different countries, from lowering transaction costs or management costs, or when the parent company has specific competitive assets (often immaterial); such corporations deal with both production and service activities,
- conglomerates, or corporations with diversified activities; the production of individual branches is neither interrelated horizontally nor vertically; they are created to differentiate the risk resulting from the company's operations (Czarny, Kleinert, 2004).

Thus, individual corporate taxonomies, created on the basis of various criteria, are complementary, not competitive, and individual corporations may at the same time be included in many classifications.

THE PLACE OF THE CORPORATION IN GEOGRAPHY OF INDUSTRY

The issue of corporations is the subject of research in many scientific disciplines, mainly economic and geographic sciences. In geography, the issues analysed belong to geography of enterprise, i.e. one of the currents of geography of industry, part of economic geography. Modern geography of industry is eclectic, because it is assumed – after R. Hayter (1997) – that the boundaries between theories get blurred, and the concepts, terminology and methods associated in the past with one theoretical approach are used and modified in other approaches.

T. Stryjakiewicz (1999: 24–27) distinguishes three theoretical and methodological orientations in geography of industry, which are now complementary: neoclassical, behavioural and institutional. From the point of view of the subject of research in this publication, institutional orientation[1] requires a broader discussion. In this theory, in contrast to the neoclassical theory, the goals, priorities and strategies of enterprises are largely autonomous and, being a part of the environment, can be changed considerably and not only passively accepted. Institutional orientation is closely related to geography of enterprise (or corporate geography) developing since the 1960s. "This research direction underlines the role of economic organisations (in particular, large supranational enterprises) as the basic element of shaping the structure and spatial transformation of the entire economy industry. B. Domański (1997) describes it as an underrated current of research in the Polish economic geography" (Stryjakiewicz, 1999: 24–25).

Thus, the issues raised refer, as many authors point out, to the mainstream of geography of industry research (Stryjakiewicz, 2001a; Wieloński, 2003, 2004; Zioło, 2001, 2003, 2004, 2006a, 2006b; Zorska, 1998, 2002, 2007).

Research problems of corporations in Polish literature on the subject

So far, research into corporations in geography of industry in Poland has focused primarily on the problem of the diversification of the world's industrial space in terms of:

- *concentration of head offices*, also focusing on the essence of the head office, in which strategic decisions are made for corporations, even if it is significantly distant from the branches these decisions concern. The authors often explain the decision process and the rules of the corporation's operation and their management head offices through example studies of the corporations (Domański, 2002; Gierańczyk, Stańczyk, 2003; Kilar, Cieluch, 2008; Kilar, 2014a, 2014b, 2015, 2016; Sala, 2003, 2005; Śleszyński, 2001a, 2001b, 2002b, 2015; Zioło, 2003, 2006a; Zioło, Piróg, 2002; Tobolska, 2010a, 2010b; Raźniak, Winiarczyk-Raźniak, 2014),
- *processes of formation as well as theories and factors of location* of production, service and various departments; these are often considerations in which the researchers explain empirical examples of the most important motives that have influenced the location of corporation branches and its formation. In this way, the authors, when referring to the location theory, sometimes consider the spatial diversity of corporations in the world (Gługiewicz, 1997; Spector, 2000; Stryjakiewicz, 2001a, 2001b, 2009a 2009b; Stryjakiewicz, Wajda, 2003; Tkocz, 2003; Wajda, 2003, 2006; Wajda, Zoricic-Wołek, 2003; Wajda, Zalewska, 2003; Budner, 2004; Kostrubiec, 2006; Micek, 2006a, 2006b; Kilar, 2007, 2009c, 2010a, 2010b, 2011a, 2011b, 2014a; Kilar, Cieluch, 2008; Tobolska, 2008a, 2010a, 2008b, 2011, 2014,

[1] In the institutional orientation, location factors are not a feature assigned to a given location, but are the subject of various negotiations and persuasions, e.g. labour costs, prices or tax levels. According to the institutional theory, this process is controlled by technostructures, i.e. professional, specialised decision-making entities that undertake various activities, including their responsibility for negotiating, which takes place, for example, in market procedures and transactions and relations between national governments and corporations. The methodological pattern of institutional orientation research is classified as an intensive group and consists in an in-depth analysis of outstanding cases (case study), which according to many authors allows to fully understand the complexity of many processes and their dependence on internal and external conditions.

2017; Zioło, 2009a, 2009b, 2011; Bonar, 2009a, 2009b, 2011; Tkocz, Żydzik, 2010; Boguś, 2011a, 2011b, 2012),
- *network connections,* which somehow relate to the processes of the formation of corporations and their functioning, but it also includes research on the examples of corporations and networking in the world, as well as theoretical and methodological considerations of the possible effects of network connections (Stryjakiewicz, 2001a, 2001b, 2008; Tkocz, 2003; Wieloński, 2003; Zioło, 2003, 2011; Friedman, 2006; Paszkowski, 2008),
- *corporate strategies* and their organisational forms, which is a complex research problem; by embedding it in theoretical considerations and showing the spatial dimension of the analysed concepts, on empirical examples, it allows learning and understanding this issue more closely (Sowa, 2006; Tobolska, 2006b, 2017),
- *the influence of corporations on international conditions for industrial development in national and regional systems*; on the one hand, the conditions necessary for increasing the attractiveness of the area for the location of corporation branches and industry development in a given place are approximated, and the examples of local government activities in this area are mentioned (Tkocz, 2003; Tkocz, Sobala, 2006; Kilar, 2007, 2009a, 2009b, 2014c; Matykowski, Tobolska, 2009; Lizak, 2010; Micek, Działek, Górecki, 2010; Tobolska, 2017) *and the surrounding industrial enterprises,* because often the location of the corporation's branch in the region poses a challenge for the surrounding enterprises, due to its possible competitiveness, but also gives the opportunity to the organisation to learn (Rachwał, 2003; Wieloński, 2003; Zioło, 2003, 2008; Reśko, 2006; Czapliński, Stawarska, 2010),
- *stimulating the process of inflow of foreign direct investments and export links*; it is a broad issue that in geographical work, apart from the spatial aspect, is also examined from the perspective of factors that attract FDI and, on the other hand, the expected effects and sizes of investment in the host country (Przybylska, 1998, 1999; Domański, 2002; Rachwał, 2003; Brezdeń, 2006; Gierańczyk, 2006; Komornicki, 2006; Sala, 2006; Tkocz, Sobala, 2006; Tobolska, 2007; Kowalska, 2011),
- *the influence of corporations and their branches on the shaping of various industrial sectors,* which results, inter alia, from the transfer of broadly understood innovations, e.g. technological or organisational, by a corporation, but also from rapid technological progress (Gierańczyk, 2006; Huculak, 2006; Szmytkowska, 2006; Kilar, 2014a),
- *indicating the role of cities in the processes of globalisation and the location of corporations in cities* and its effects, which is interesting for some authors, due to the research of the function of the location centres, assuming that they are the control and management centres (Śleszyński, 2002a, 2007; Tobolska, 2010b; Wdowicka, 2012; Raźniak, Dorocki, Winiarczyk-Raźniak, Płaziak, Szymańska, 2016),
- *corporate CSR activities,* i.e. corporate social responsibility conducted by corporations, manifestations of this responsibility and their effectiveness in various aspects (Kowalska, 2012, 2013, 2018).

In the literature (e.g. economic) corporations are still considered from many other points of view, but the issues presented above are most often captured in a geographical way, that is, in relation to space. Geographical approach to corporate issues gives the opportunity to consider their activities in a wider, complementary way. In most

cases, the analysed phenomena are provided with figures and maps, especially the issues concerning the diversity of corporations in the world and national space, which more fully illustrates the issues under investigation, e.g. the location of various types of departments and various functions in local and global spatial systems.

The most important source which contains publications in this field in Poland is the academic journal *The Studies of the Industrial Geography Commission of the Polish Geographical Society*, but some of the research results in geography of industry have been published in the form of various types of monographs.

Summary

The issue of corporation in geographical literature, as it is apparent from the research, is widely undertaken. a definition of corporations and their delimitation, as well as indication of the position of corporate research in systematics of geography are interesting and current topics from the point of view of both the world economy, domestic and local interests, as well as companies and individuals, and therefore are studied by many researchers. Differentiation of corporate issues in the literature is mainly due to a broad spectrum of the factors influencing the location of the corporation on the one hand, and the effects of its operations, both short-term and long-term, on the other hand.

It seems necessary to continue research into the problems of corporations by Polish geographers of industry, but the apparent shortcomings concern sectoral differentiation of the largest economic entities in the national and regional space. It is to be hoped, therefore, that further research of corporations in the field of geography will continue as both empirical and conceptual studies, in various Polish research centres.

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Research Issues of Structural Changes in Polish Industry in Geography of Industry

Abstract: The research themes of geography of industry are continually evolving. The dynamic development of this sector of the economy after 1945 in the conditions of the socialist economy, in which the processes of industrialisation of the country were treated as priorities, as well as the processes of economic transformation in Poland after 1989, influencing the changes in the previously developed socio-economic structures, including industry structures, influenced the shaping of the research problem of this sub-discipline of geography in Poland. These changes, leading to the adaptation of these structures to the changing management principles, take place under the influence of impulses from the international environment associated with building a knowledge-based economy and moving from the industrial and post-industrial phase to the informational phase of civilisation development. These essential issues of transformation of industrial structures in the period of economic transformation and the development of a knowledge-based economy have become the subject of interest of many researchers, including economic geographers. The article presents the evolution of the themes and the main directions of research on structural changes in Polish industry in the conditions of transition from the centrally planned economy to market economy. In conclusion, it is shown that Polish geography of industry has undertaken significant scientific and economic problems of structural changes in industry during the period of economic transformation, continually updating its research priorities. Researchers quickly reacted to changes in the legal and political conditions of the functioning of the national economy, despite numerous barriers, related to, among other things, limited access to data on industrial activities, resulting in the lower interest of geographers in industrial research. The paper ends with recommendations regarding future possible research directions and a comprehensive bibliography of the studies.

Keywords: industrial change; industrial geography; Polish industry; research issues in industrial geography

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Introduction

Research issues of geography of industry have been continuously evolving, which is reflected in the changing research directions. Growing scientific achievements, based on the results of many empirical studies, requires further syntheses to identify changing research problems and directions, learn about the patterns in development of industrial enterprises, spatial forms of industry concentration, industrial regional, national, European and global systems, as well as changes in the spatial and branch structure of industry.

The development of this sector of the economy after World War II in the conditions of central economic planning, referred to as the socialist or command-and-distribution economy, as well as the processes of economic transformation in Poland after 1989, which took place in the conditions of globalisation and European integration, affecting the transformation of previously developed socio-economic structures, including industry ones, had a particular impact on the development of research in this sub-discipline in Poland. These changes, leading to the adaptation of these structures to the changing management principles, take place under the influence of impulses from the international environment associated with building a knowledge-based economy and moving from the industrial and post-industrial phase to the informational phase of civilisation development. Their effect are changes in the sectoral structure of the economy, in which industrial activity, being the economic base in the industrial phase, gives way to service activities, in particular, activities related to financial services, education, science, as well as research and development. However, it should be emphasised that this reduction in the role of industry in favour of services mainly concerns the activation of labour resources, not its significance in the development of civilisation. The consequence of this process is the change of the existing spatial and branch structures of industry and its functions in the economic development of spatial systems of various scales, from local systems, through regional to national and international.

These crucial problems of changes of industrial structures in the period of economic transformation and the development of a knowledge-based economy have become the subject of interest of many researchers, representatives of various scientific disciplines, including economic geographers. A particular role was played by the studies undertaken in the field of geography of industry, which during the period of dynamic changes in the role of industrial activity in the economy, industrial policy directions, and changes in the accessibility of data on production activities, had to analyse its previous achievements and undertake new research issues, in accordance with the emerging challenges, both in methodological terms and in terms of business practice. After all, these studies have always served not only theoretical-cognitive but also application-oriented goals, supporting the formulation of strategic goals in the field of directions of economic transformation and changes in industrial policy. It should also be noted that the interest in research in the field of geography of industry, as well as the scope and direction of undertaken studies, was influenced mainly by changes in the availability of industrial statistics, in particular restrictions on the availability of unit data on the functioning of individual industrial enterprises.

The aim of the article is, therefore, to attempt to outline changes in the field of scientific interests of Polish geographers of industry, to identify the main research fields and related significant achievements, both cognitive and in the application of new

methods of research of structural changes in Polish industry. It will be aimed at answering the question of the extent to which the new research issues in the field of geography of industry are part of the current research and application priorities of Polish science. Particular emphasis will be put on research problems undertaken during the period of intense changes related to systemic transformation in Poland in the last nearly three decades connected with the transition from the centrally controlled economy to market-based economy.

To this end, analyses of over 200 articles in various journals and monographic publications related to the development of research issues of Polish geography of industry in the field of transformation of this sector in Poland were carried out. This work was primarily presented at conferences on geography of industry organised every year in Krakow (Rachwał, 2015a) and published, especially in the last 18 years, in the "Studies of the Industrial Geography Commission of the Polish Geographical Society" (Polish title: Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego), as well as other leading journals and publishing series, both national and foreign. Based on the analysis of previous studies, an attempt was made to outline new challenges and possible directions of research that could be taken up by geographers of industry in Poland. Due to the vastness of the issue and the limited possibilities of its detailed presentation in the form of an article, only some of the selected items of literature were referenced in work, although the list of references is extensive. A particular limitation in the analysis of literature is posed by the problem of attributing the author to the discipline of geography (differences in the scope of scientific degrees obtained and self-determination of research interests). However, it was assumed that the most crucial issue is the scientific problem (the subject of interest in the problems of geography of industry) rather than the formal attribution of a given author to the discipline of geography in the light of Polish division of sciences.

Development of problems and research directions of geography of industry during the centrally controlled economy

As a result of intense industrialisation in the 19th century and the first decades of the 20th century, geography of industry emerged as an independent sub-discipline of geography with strictly defined goals and research tasks, as well as specific research methods. It is assumed that it was distinguished in the structure of world economic geography in the 1930s and 1940s. In Poland, geography of industry was formally distinguished in the structure of economic geography, along with geography of transport, geography of agriculture and geography of settlement, at a methodological conference in Osieczna near Poznań (now Wielkopolskie Voivodeship), held from 28 November to 1 December 1955 (Misztal, Zioło, 1998a). As commented by J. Grzeszczak (2011), this conference decided the fate of the Polish economic geography for the next few decades. In his opinion, it can be said without exaggeration that the roots of contemporary economic geography are still stuck in the ground prepared by this conference, and this applies above all to the branch specialisation developed on a large scale. It involved a complete reconstruction of relevant research plans, curricula and organisational structures (Grzeszczak, 2011). As stated by T. Stryjakiewicz (2010), the boundaries between a significant part of industrial and service activities have been blurring recently, therefore the problems of geography of industry "blends in" with the research in the

field of economic geography (taken as a whole, i.e. without the "branch" division into sub-disciplines) and this trend is consistent with the global trend. It is associated with difficulties in the analysis of contemporary changes in geography of industry which is related to the emerging problems in defining the scope of the subject discipline during the period of industry servicing.

Of particular importance to the academic achievements of geography of industry in Poland are bibliographies of the distribution of industry, including literature from 1945–1962 (Fajferek, 1963) and bibliography of the geography of industry for 1963–1983 (Pakuła, Troc, 1987). Moreover, the achievements of geography of industry include bibliographies on regional planning in 1945–1965 (Zawadzki, 1969) and in 1966–1970 and 1971–1980 (Wrzosek, Zawadzki, 1974, 1985), as well as a discussion of research of the former Committee for Research on the Regions under Industrialisation of the Polish Academy of Sciences (Czyżewska, 1969).

The fundamental role in organising the research issues of geography of industry includes papers on determining the directions of research on the spatial structure of industry and the prospects for its development (Leszczycki, Kukliński, 1964; Kukliński, 1964, 1976, 1981), basic research directions (Grzeszczak, 1964, 1985, 1991), determining trends in the development of geography of industry (Dobrowolska, 1965, 1978; Straszewicz, 1987), new tendencies and directions in spatial research of industry (Kortus, 1978a, 1978b, 1987, 1999; Kuciński, 1998) and presenting an outline of the research concept of spatial forms of industry concentration and spatial structure of industry (Zioło, 1971, 1976, 1978, 1987, 1997, 2008; Pakuła, 1978, 1983).

In the years of the central control system of the economy, covering the phase of industrial development, an unusually large interest in the problems of geography of industry resulted from the fact that industry was treated as a leading factor of the socio-economic development. A unique role in this area was played by studies devoted to the impact of industry on socio-economic and cultural development, especially regional systems. They intensified as part of the work of the former Committee for Research on the Regions under Industrialisation, which was related to the analysis of the impact of developing substantial industrial investments on the transformation of agricultural areas. Particularly comprehensively, these studies were conducted in the "academic school" of prof. Maria Dobrowolska (Dobrowolska, 1965; Zioło, 1978, 2017).

Stryjakiewicz (1987, see also 1992, 2010, 2014), analysing the research directions of geography of industry in 1945–1980, distinguishes a number of primary groups of problems that concern: the origins and development of centres, districts and industrial regions, branch and spatial structure of industry, industrialisation processes, industry links with the natural environment, location factors and assessment of the efficiency of industry operations, as well as theoretical and methodological issues. Kortus (1987) after Kukliński (1981) discussed current trends and research problems in geography of industry and then presented selected elements of the functioning of the global industrial system and desirable research approaches.

S. Misztal (1997), and S. Misztal and Z. Zioło (1998a), after A. Kukliński (1976) and B. Kortus (1986), as the primary research directions of geography of industry developed in the post-war years enumerate landscape, physiographic, historical-geographical, technological-economic, behavioural and systemic directions. S. Misztal (1997) also distinguished the methodological-theoretical and planning direction, related to the studies on creating plans for economic development based on industrialisation.

Attention was also paid to disharmony between the intensification of the industrialisation and urbanisation processes (Fajferek, Zioło, 1979, 1983).

The primary goal of the landscape direction in geography of industry was to study the industrial landscape, referred to as a fragment of the surface of the Earth, where industrial plants that meet specific economic and social functions visually dominate. This trend in Poland in the post-war period did not find many supporters, although recently there has been a return to research on cultural landscapes; industrial landscapes are also distinguished in the latest delimitation of landscapes (Chmielewski, Myga-Piątek, Solon, 2015). These studies, among others, refer to earlier studies of M. Dobrowolska in this regard (1948). In the physiographic direction, attention was mainly paid to the influence of mutual relations between an industrial enterprise and individual elements of the natural environment. On the one hand, they explained their role as essential factors in the location of industry, and on the other, the influence of industrial activity on changes in the elements of the natural environment was determined. Currently, due to the increasing degradation of individual elements of the natural space, this direction is reflected in ecological research, focusing on the impact of industry on nature and the environment of human life.

The primary goal of the historical-geographical direction was to explain the development processes of industrial plants, as well as the structure of the industry in various spatial systems based on historical research. Using the historical method, it was attempted to determine the location factors and conditions affecting the development of industrial plants representing various industries or their stagnation, recession or disappearance. The beginnings of the development of the factory industry, often developed on the activities of factories and crafts, were sought after. At the same time, the process of transformation of industrial structures was analysed concerning the current administrative division and according to the current industry classification. Using the genetic method the current industry structure of the studied area was often sought. Attention was paid to the stability of industrial plants in the modern industrial structure, change of their potential and durability of the functions performed. In the technical and economic direction, however, the primary attention was paid to the study of changes taking place in the technology of industrial production, which influenced the increase of production potential and changes in the plant location. Attention was paid to the variability of location factors and the degree of attractiveness of the area for developing production activities under the influence of scientific and technological progress. In behavioural studies, it was assumed that in order to explain the contemporary industrial structure and potential, it is necessary to analyse behavioural changes of individual investors or other decision makers who used specific conditions, mainly legal, financial and market conditions, thus exerting roper influence on the selection of plant locations and directions of development of industrial enterprises.

The systemic direction developed as a result of the use of the concept of dynamic systems and statistical methods in the field of geography of industry. It was assumed that the industrial system includes specific elements and relations between them. On this basis, attempts were made to explain the functioning of industrial enterprises, as well as the intensification of active and passive relations taking place between enterprises in the structures of industrial centres and districts, as well as their connection with the surrounding. It was assumed in this respect that both enterprises and forms of industry concentration (centres, industrial districts) are not isolated units, but function

as elements of a more complex spatial structure of industry and the structure of geographical space. Based on the outlined research concepts, attempts were made to build theoretical models of the functioning and development of an industrial enterprise, shaping territorial forms of industry concentration (centre, district, complex), changes in the spatial structure of industry and determining its place in geographical space (Zioło, 1971, 1976, 1978, 1987, 1997). These directions have been represented in the studies of members of the Industrial Geography Commission of the Polish Geographical Society from the very beginning of its establishment in 1979 (Zioło, Rachwał, Kilar, 2018). It is due to the activities of the majority of geographers of industry in this Commission, which is also taking place today.

The significant achievements of Polish geography of industry were presented in the joint study of the Industrial Geography Commission of the Polish Geographical Society in the years 1976–1996 (Misztal, Zioło, 1998b). Individual authors presented research results of national geographic centres (Warsaw, Krakow, Łódź, Poznań, Katowice, Wrocław, Toruń, Gdańsk, Lublin, Kielce, Słupsk, and Rzeszów), documenting it with extensive literature on the subject. Generally, the editors of the volume distinguished five research directions from the point of view of the applied methods and based on the studies listed above: information-statistical, analytical-explanatory, planning-forecasting, cartographic, raw material (Zioło, Rachwał, Kilar, 2018). In the analytical and synthesising studies, the methods of these research directions often merge with each other, which undoubtedly increases the methodological and application value of their results. In individual centres in the undertaken studies, researchers pay attention to directions of products sales, supply of industry with energy, water and other raw materials and components, sewage disposal and waste management, cooperative links, economic effects of location and industry development, social, economic and ecological effects of processes of industrialisation in regional systems, delimitation of industrial centres and districts, processes of industrial deglomeration, restructuring and privatisation of industry, as well as problems of teaching geography of industry in school and university education.

Research topics of structural changes in industry in the years of economic transformation

A smaller interest in the issues of geography of industry is noted after 1989, in the years of transformation and implementation of market economy rules. Especially in the early years of the reconstruction of management system of the national economy, the processes of political and economic transformation were accompanied by the collapse of many critical industrial enterprises, which contributed to the decreasing importance of industry in the structure of national economy (incl. Rutkowska-Gurak, 2000; Kieżun, 2012; Karpiński, Paradysz, Soroka, Żółkowski, 2013; Ślązak, 2016). Rachwał (2001, 2006) drew attention to erroneous decisions regarding the directions of state intervention in the framework of industrial policy, which was manifested in supporting traditional branches and industry plants whose role in the economy is declining, leaving without such support the plants representing modern industry branches, such as electronic industry (Rachwał, 2001). Attempts to repair these errors through reindustrialisation programs are now costly. Some researchers have mistakenly accepted the liquidation of enterprises and the shrinking role of industry as a labour market as

a sign of the country entering the phase of post-industrial development or cumbersome deindustrialisation processes. This was accompanied by increasing difficulties in access to the empirical database regarding the operation of industrial enterprises and limited information about official statistics. Accepting the thesis about the decreasing role of industry as the base of economic development in favour of service activities, influenced changes in research interests of many people and undertaking issues for which broader and easier access to information was possible (Zioło, Rachwał, 2008, 2014). It should be emphasised, however, that the researchers (Kilar, Rachwał, Wiedermann, 2008; Rachwał, 2008, 2009, 2011a, 2011b; Rachwał, Kilar, Wiedermann, 2009; Kilar, Rachwał, 2014) pointed out that these processes are not so much a manifestation of deindustrialisation and the decreasing importance of industry in the economy; instead they testify to the decline in the role of industry in the field of labour resource activation as a result of mechanisation, automation, robotics and computer control of production processes. The problem of limiting access to data on industrial development in new management conditions and thus the decrease in the interest of researchers in these problems attracted the attention, among others, of T. Rachwał (2008), and on the issue of the return of geographers of industry in research into economic sciences or social sciences, or other geographic sub-disciplines – P. Czapliński (2008, 2009). On the other hand, it should be noted that profound economic changes, including industry sector, have naturally caused researchers' interest in these changes. Therefore, despite the difficulties in accessing data, many economic geographers have taken up research on the transformation of industrial structures, seeing this as an opportunity to explain changes in transition from a centrally managed economy to market economy in Poland and many other countries of Central and Eastern Europe, so far unprecedented in this scale in economic history.

The issue of the impact of changes in the management system and the implementation of market rules on the industry activity was reflected in research studies focused around the Industrial Geography Commission of the Polish Geographical Society. After the establishment of the Commission in 1979, the issues concerned were mainly related to the location and shaping of an industrial plant and spatial forms of industry concentration (centre, district), regional problems of industrialisation, followed by the behaviour of industry in the changing economic and political system. In 1995, a summary of the research problems of geography of industry was presented in the aforementioned collective work "The achievements of Polish geography of industry in the research of academic centres" (Misztal, Zioło, 1998b). Later, P. Czapliński (2008, 2009), T. Stryjakiewicz (2010, 2014), and Z. Zioło (2014) determined research directions, as well as the strengths and weaknesses of Polish geography of industry, including those related to other industrial sciences.

In the years of implementing the market economy, the importance of the services sector in the activation of labour resources and the dynamics of socio-economic changes in spatial systems is growing, and the boundaries between industrial and service activities are disappearing, of which the IT sector is a good example. It was reflected in the studies of the Industrial Geography Commission of the Polish Geographical Society, in which, apart from the research topics of the industry, selected entities and sectors of service activity are also presented. Attempts are also made to evaluate innovativeness and structural changes in both sectors of the economy (Dominiak, Rachwał, 2016). In the area of industrial issues, the primary attention was paid to the following:

- adaptation of industry to new conditions of management and transformation of spatial and industry structures of industry in the process of implementing market economy rules (e.g. Rydz, Jażewicz, 1994; Matykowski, Tobolska, 1994; Tobolska, 1997; Stryjakiewicz, 1999; Gierańczyk, 2000; Domański, Guzik, Gwosdz, 2005; Gwosdz, Micek, 2010; Czapliński, 2010, 2014; Rachwał, 2011a, 2012, 2015b; Gierańczyk, Rachwał, 2012; Mrozińska, 2013);
- international and internal (national) determinants of the development of domestic industry and its structural changes under the influence of globalisation processes, moving to the informational phase of civilisation development and – what is essential in Polish conditions – the process of European integration and implementation of new legal instruments related to systemic transformation (see e.g. Zioło, Rachwał, 2006, 2016a);
- the impact of various international and national conditions on the functioning of industrial enterprises as the essential elements of the spatial structure of industry (see, e.g., Rachwał, Zioło, 2016b; Zioło, 2016);
- effects of the restructuring of enterprises and spatial and branch structures on the background of the changing business environment (e.g. Pukowska-Mitka, Tkocz, 1992; Rachwał, 2002, 2006, 2010, 2011b);
- the role of foreign capital in increasing innovation and changes in spatial, ownership and branch structures of Polish industry (e.g. Domański, 1999, 2002, 2003a; Stryjakiewicz, 2005c; Brezdeń, 2006; Tkocz, Sobala, 2006);
- the impact of the economic crisis on the behaviour of industrial enterprises and changes in national and regional economic structures (e.g. Czapliński, 2011; Zioło, Rachwał, 2011; Rachwał, 2011c, 2014; Domański, Guzik, Gwosdz, Dej, 2013; Kilar, 2014a; Zioło, 2014b);
- the impact of industry innovation on the transformation of the economy in spatial systems (e.g. Bal-Woźniak, 2009; Borowiec, Dorocki, Jenner, 2009; Rachwał, 2012; Zioło, 2012; Brezdeń, 2015; Gierańczyk, Sadoch, 2015; Rachwał, Wiedermann, 2015);
- shaping spatial industrial systems, functioning of industrial centres and districts, as well as industrial clusters treated as new forms of industry concentration (e.g. Dziadek, 1990; Szajnowska-Wysocka, 1990; Rochnowski, 1993; Rydz, Jażewicz, 1997; Gierańczyk, Stańczyk, 2001; Domański, 2003b; Pakuła, 2003; Zioło, 2008b; Dyba, Stryjakiewicz, 2014; Tkocz, 2015; Domański, 2015; Dyba, 2017);
- the role of industry in the development of a knowledge-based economy (e.g. Domański, 2000; Rachwał, Wiederman, Kilar, 2009; Heder, Tkocz, 2013; Rachwał, 2013; Zioło, Rachwał, 2013);
- changes in the export structure of Polish industry (e.g. Komornicki, 2006; Wieloński, 2010; Szejgiec, Komornicki, 2015).

The interest of researchers in the field of factors and the assessment of the location of the industry was continual (though slightly smaller than in previous years) (Fierla, 1994, 1996; Fierla, Kuciński, 1996, Kuciński, 2001; Stryjakiewicz, 2009; Tobolska, 2011; Godlewska-Majkowska, 2013, 2015, 2016). In addition, research issues not addressed directly to the structural changes of Polish industry regarding control functions of international corporations and large industrial enterprises and their role in the development of spatial arrangements were also undertaken (Domański, 2005; Zioło, 2006; Śleszyński, 2007, 2008, 2014, 2015; Kilar, 2014b; Raźniak, Dorocki,

Winiarczyk-Raźniak, Płaziak, Szymańska, 2016; Raźniak, Dorocki, Winiarczyk-Raźniak, 2018; Boguś, Dorocki, 2018), as well as processes of transformation of the industry or its selected departments in selected countries (e.g. Dorocki, Borowiec, Boguś, 2013; Dorocki, 2014; Wójtowicz, Rachwał, 2017; Wójtowicz, 2017).

Empirical research studies were undertaken at various spatial scales. The following levels of analysis can be distinguished here:

- mega- (structure of global industry),
- macro- (structure of domestic industry),
- mezo- (branch structure of the industry and regional structure of the industry),
- microeconomic (an industrial enterprise, including internal changes of enterprise structures, e.g. employment structure, production mix).

None of these levels of analysis is dominant, but in the last thirty years there has been a systematic decline in interest in the research of individual industrial enterprises, in particular their spatial relationships in terms of sales and supply, technical and economic aspects of functioning, and links to the labour market, due to the difficult access to individual data or business secret, which often prevents the publication of studies using such data (Domański, 1997; Rachwał, 2008). It is worth emphasising, after B. Domański (1997), that geography of enterprises is an essential trend, though undervalued, in the study of geography of industry. It is because an industrial enterprise is a fundamental element of the industrial structure, and many transformations on a regional, branch or national scale cannot be well interpreted without considering the functioning of enterprises. Therefore, many geographers of industry, despite the difficulties, try to undertake them. They mainly concern the ownership structure, production, employment, sources of supply, sales directions, technological issues and environmental impact (in the scope of pollutant emissions, sewage disposal, waste collection), as well as revenues and costs of enterprises. As some of the industrial enterprises in the transformation years were closed down, the problems of transformations and revitalisation of industrial areas were also taken up (e.g. Domański, 2002a).

In the field of empirical studies, an apparent evolution of research interests is observed, referring to the stages of economic transformation and changes in the international surroundings; while maintaining interest in issues that have been the subject of research into geography of industry for many years. In this respect, the following five research periods can be distinguished:

- initial period of economic transformation (period of the so-called transformational shock): 1989–1993, in which research focused on the impact of a sudden change in the management system on industrial activity, with particular emphasis on changes in ownership structures,
- fundamental transformation period: 1994–2004, in which, among others, studies related to adaptation of enterprises and individual industries to new management conditions, the progressing privatisation process and the role of foreign capital in this area; studies were also undertaken in relation to the impact of the exclusive economic zones mechanism on the spatial structure industry,
- the primary phase of European integration: 2004–2007, in which researchers paid particular attention to the effects of Poland's entry into the single European market for domestic industry,

- period of the global economic crisis: 2008–2015, in which the studies related to the impact of crisis phenomena in the country and the international surroundings on the functioning of enterprises and the transformation of industrial structures,
- period of recovery from the crisis (since 2016), in which researchers pay attention to new challenges and barriers to industrial development.

Various methods and research approaches were adopted in the studies. T. Stryjakiewicz (2010) distinguished three contemporary methodological orientations: evolutionary, relational, and institutional. Relatively rarely, studies were based only on one of these three contemporary orientations, but there is much interest in institutional orientation (e.g. Stryjakiewicz, 2007; Stachowiak, Stryjakiewicz, 2008; Stachowiak, 2008, 2009; Micek, Gleadle, Dawidko, 2014).

Theoretical problems focused mainly on attempts to model approaches and building theoretical concepts of geography of industry against civilisation development, building a knowledge-based economy and internationalisation of production activities. Particular attention was paid to: attempts to improve the spatial structure of industry, modelling the functioning of geographical space and determining the place of industrial enterprise and territorial forms of industry concentration, industrial transformation in changing economic conditions and its functions in regional, national and global economy (Zioło, 1997, 2008a, 2017; Gierańczyk, 2008a), improving the research problems of enterprises (Rachwał, 2008), attempts to define changes in industry location trends in the era of globalisation (Gierańczyk, 2008b), the concept of multiplier effects in determining the impact of industry on the environment (Rachwał, Wiedermann, 2008; Domański, Gwosdz, 2010), shaping the network economy (Stryjakiewicz, 2001, 2005a, 2005b; Paszkowski, 2008). Assessment of research problems, as well as strengths and weaknesses of Polish geography of industry (Kuciński, 1992; Parysek, 1993; Pączka, 1994; Stryjakiewicz, 2014) and evaluation of research problems and achievements in geography of industry against the economic sciences (Czapliński, 2008) were also carried out. Problems of structural changes indicated as one of the trends of research, whereby the importance of research in the field of geography of industry in the field of changes in the spatial structure of industry is stressed. It was assumed that research should be developed in order to comprehend the changing structures of industry and services in specific social, economic and spatial conditions.

It is worth emphasising that the studies undertaken in the theoretical-methodological trend often included a partial exemplification of the presented models and theories based on empirical research.

The results of the research were published mainly in the form of articles in national (mainly the Studies of the Industrial Geography Commission of the Polish Geographical Society as the only journal in Poland devoted to the geography of industry) or foreign journals. The prestige of the journal or publisher and the so-called scoring, or the value of a given journal on ranking lists of journals of the Polish Ministry of Science and Higher Education is crucial. For this reason, publications on geography of industry in the form of scientific monographs are rare. Low so-called "score value" of chapters in such monographs as well as entire monographs caused little interest in this type of presentation of results. The only exceptions were monographic publications related to obtaining scientific degrees – doctorates, habilitation or professorship. The same factor causes little interest in the development of academic textbooks for geography of industry in recent years, except for the exercise book on economic geography with an

industry chapter (Czapliński, Rachwał, Tobolska, Uliszak, 2013). The phenomenon of using only the score value while choosing the place of publication should be considered harmful because it means the influence of non-subject factors on the selection of the best form of dissemination of research results. Part of the studies was carried out on behalf of various institutions and enterprises, e.g. local self-government, ministries, bodies managing special economic zones or industrial parks, which is why their results were published as research reports or expert reports. Some of the results were presented in the form of conference abstracts, a report from the Polish Academy of Sciences committee meetings and posters at conferences. Due to the lack of the habit of publishing posters, this is the most elusive form of presentation, if the authors do not decide to prepare a scientific article on this subject.

Conclusions and recommendations

Polish geography of industry has undertaken significant scientific and economic research problems of structural changes in industry in the period of economic transformation, continually updating its research priorities. Researchers quickly reacted to changes in the legal and political conditions of the functioning of national economy, despite numerous organisational barriers related to limited access to data and not very favourable location of economic geography in the structure of sciences, often attributed to natural sciences with entire geography. Undoubtedly, however, the advantage of empirical and descriptive studies of selected examples over syntheses is noticeable.

In the process of developing research issues in the field of geography of industry and methodology of studies undertaken in Poland, many patterns were used from foreign literature, but also many new proposals were put forward that could be used by foreign researchers. A particular contribution of Polish geography of industry is noted in the field of structural changes in industry during the period of economic transformation. It seems, however, that until now too little attention has been paid to the promotion of national research results in international environment, which affects the relatively low knowledge of Polish achievements by geographers, economists and representatives of other disciplines dealing with the transformation of industry. It seems that in this respect, these achievements have been relatively rarely published in the most renowned international journals.

The prospects of further development of research in the field of geography of industry in Poland may be affected by barriers of human nature. Geographers' departure from this issue can be observed. The basis of this process is very diverse. On the one hand, it is related to limitations in access to detailed data, and on the other hand, to the above-mentioned blurring of the boundaries between the industrial and services sectors, which raises questions about the validity of a further "industry" approach to research in the field of economic geography. It seems, however, that when production activity is still of great importance in the functioning of national economies at all stages of development, even the most developed, and reindustrialisation programs are implemented in many countries, research in geography of industry still has a future and essential cognitive and application functions to meet.

It seems that in the coming years particular attention should be paid to the studies synthesising existing research in the field of transformation of industrial structures in the period of change in the economic system in order to develop model approaches and

determine the best research methods of this process. The following research issues also seem to be worth undertaking:

- directions of expansion of Polish industrial enterprises on international markets, including mergers and acquisitions of foreign enterprises due to high competitiveness in the international environment of many domestic enterprises and their more and more advanced functions on global markets,
- various network connections of domestic industry with global industry,
- still existing barriers to the development of industry, related to the relatively low innovation of Polish economy, low technological advancement of some industries and the lack of adequate human resources on the labour market,
- directions of new industrial policy and evaluation of the implementation of re-industrialisation programs, based on the concept of industry 4.0, in Poland against the experience of other countries, including the industrial policy of the European Union,
- improvement of goals and methods, as well as the implementation of educational content in the field of industry in school and academic geography, especially in the conditions of implementing the reform of the education system in Poland.

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Polarity of the Regional Space – the Dilemma of Shaping the Investment Attractiveness of Poland

Abstract: This study aims to show how the polarisation of the economic space can modify the investment attractiveness of the regional space. A thesis has been put forward that the polarisation of the economic space affects the investment attractiveness of the regional space by strengthening the polarising power of the regions with the highest investment attractiveness. This study uses the results of the parameterisation of investment attractiveness of Polish regions for 2015 by gmina; it also identifies growth poles in four five-year time periods: 2008–2012, 2009–2013, 2010–2014, and 2011–2015. The study shows that the permanent growth poles are created at a distance of several dozen kilometres from large cities. It indicates the depletion of development reserves of large and medium-sized cities, especially those with extensive space management. Smaller centres are gaining location attractiveness, especially those located in the vicinity of communication routes, where access to investment areas and lower costs of running a business attract investors. Special economic zones are also located in such places. The poles and their clusters usually form large agglomerations and industrial centres in the development phase. They are usually places with high investment attractiveness, adjusted by management decisions of large enterprises, local government units and the state government. The polarisation of the economic space affects the increase of the investment attractiveness of the regions, strengthening the succession of economic production and service functions in special economic zones. Investments in road infrastructure and revitalisation processes supported by special economic zones are essential.

Keywords: growth pole; investment attractiveness of the region; investments; local development; location

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Introduction

Economic space is affected by simultaneous tendencies to polarise and increase homogeneity. Most classical theories in this regard come from the assumption of homogeneity

of space and indicate that even in such a theoretical, model space, polarising forces come to the fore. Even if all resources and people are evenly spaced, Christaller's centres or growth poles described by F. Perroux will be created.

In economic practice, two opinions about local and regional development clash. One is based on the forces of concentration of capital and markets indicating its economic benefits. On the other hand, there are programs activating economically poorly developed areas or projects equalising differences in this respect, for example under the European Union's cohesion policy. The issue of finding a balance and complementing each other in the space of these two opposing phenomena is, therefore, an issue worth analysing for the deployment of new investments, especially in industry.

Investments are usually created in places attractive from the investor's point of view, i.e. characterised by investment attractiveness. Attractive places can be created by the central or local government unit through an investment policy, for example through tax incentives and by increasing the standard of the investment product offered at the locations for activation, restructuring or revitalisation.

The question arises, however, whether such activities should have a spatially concentrated nature, or instead take on a dispersed system, according to the needs of the local scale. How should this be influenced by the already existing polarisation, which is usually the core of further changes in spatial structures? Can the polarisation phenomena resulting from long-term spatial development trends be modified as a result of phenomena that cannot be managed by either entrepreneurs or public stakeholders? These include the disadvantages of the scale, disadvantages of the neighbourhood, domino effect, the effect of monoculture or of being influenced by foreign decision-making centres. For example, the phenomena mentioned above modify the seemingly apparent effect of space polarisation on investment attractiveness, and thus the ability to attract investment and stimulate local and regional development.

Therefore, the question arises whether there are limits to the concentration of investments in a given place. If so, how to take it into account when there is an overlap of various types of development waves coming from different decision centres? How does it affect the already existing polarisation understood as a process?

It is, therefore, a very complex phenomenon, which in this article, due to its volume, is mainly indicated by many years of research by the author and a review of world literature devoted to the issues raised.

This study aims to show how the polarisation of economic space can modify the investment attractiveness of regional space. Therefore, an attempt will be made to prove the thesis that the polarisation of economic space affects the investment attractiveness of regional space by strengthening the polarising power of the regions with the highest investment attractiveness. This study uses the results of parameterisation of investment attractiveness of Polish regions divided into gminas, poviats and voivodeships, conducted by the Warsaw School of Economics, due to the possibility of making comparative analyses at the level of gminas, which is unique for this research centre.

On the essence of the polarity of space

In the literature, the process of formation of growth poles and polarisation of regions at various taxonomic levels is widely described (e.g. Churski, 2014). Many studies point to the leading role of the French economist F. Perroux, who stated that the

unsustainable nature of economic growth, both spatially and in sectoral terms, can be mitigated by the growth poles (Perroux, 1964). Polarisation can cause both positive and negative effects, which has already been expressed via the identification of both stimulation/induction effects and inhibition. Therefore, polarisation may not occur as expected by investors, because they may face the exceedance of the optimal level of the scale of their operations, both in spatial and sectoral terms. O. Hirschman also perceived the positive and negative context of the poles as the endpoints of the axes, in which he combined the positive effects with infiltration and the negative ones with polarisation (Grzeszczak, 1999).

The cited authors are the classics of the approach, which indicates that the polar nature of development makes it necessary to stimulate the existing poles. However, there is a risk of over-stimulation, which ultimately leads to the weakening of the growth of the poles in the absence of the activation of peripheral areas and thus the consolidation or even deepening of spatial disparities. Hence, the remedy is to create growth poles as a result of substantial investments supporting the development of previously poorly economically developed areas thanks to state interventions (Myrdal, 1968). This is possible thanks to the liberation of development forces affecting both the creation of demand for goods and services in the motor unit, as well as the creation of jobs, and thus increasing consumer and investment demand.

At the same time, the geographical location of a given region relative to the centre of a given space is essential. Moving away from the centre, investments, income and technological advancement decrease (Henderson, Shelizi, Venables, 2001). Therefore, the investment attractiveness of the peripheral area located at an excessive distance from the growth pole is lower.

The growth pole is thus a distinct centre of space, polarising it and developing faster than its surroundings. For this study, it is assumed that a growth pole is the centre of the polarised region emitting developmental stimuli, and showing higher growth dynamics compared to the rest of the region. The region can be referred to spatial units of various levels of taxonomic division (e.g. local, meso-regional, macro-regional) (Godlewska-Majkowska, Komor, Typa, 2016).

The formation of poles, and thus the polarisation of space, is caused by phenomena occurring in space, often parallel, or in the form of waves of various length, initiated at different times. From the point of view of the polarisation of space, developmental waves are essential, caused by groundbreaking inventions that increase the importance of attractiveness of specific places in a given period. On this principle, we can indicate poles formed in the 19th and 20th century as a result of industrial investments during the industrial revolution based on coal and steel, and poles based on the IT revolution, the so-called silicon landscapes, created in the second half of the 20th century.

Every epochal innovation requires different conditions to flourish in a given place. Waves with new innovative solutions are transferred in areas with poorly outlined barriers to the assimilation of innovations, while, in turn, require much time to trigger important changes in places where barriers may not only cause that the given innovative idea does not reach but its source is even destroyed.

The overlap of developmental waves, running at different speeds, or even omitting some areas, causes that polarisation takes place in varying degrees and with different strength in particular places of the economic space. In Poland, an example of this may be the persistence of the high level of industrialisation in south-western Poland, as a

result of overlapping successive waves of innovations, while the level of industrialisation in Podlasie remains low.

The carrier of changes can be a sizeable individual investor, a state investment directed at the activation of the region, or the bottom-up concentration of numerous small businesses.

Historically shaped poles based on large enterprises with several thousand employees and with high ease of creating a network of cooperative relations in line with the concept of growth poles had an uncomplicated ownership structure. Thus, they were independent of other entities. Nevertheless, they often required numerous co-operators or companies integrated vertically or horizontally, in order to optimise operational processes. It is how the combined plants, i.e. large factory complexes, developed, jointly using the infrastructure, or creating numerous market links thanks to the benefits of diversity.

This type of processes led to the formation of industrial centres and districts, which in subsequent stages were natural points strengthening the polarisations of their natural regional surrounding. To this day, it is visible in the form of concentration of industrial enterprises in cities of at least medium size, as well as agglomerations. This mechanism explains the general principle that the more polarised a region is, the higher the investment attractiveness of its pole or group of poles.

Looking at the map of Poland's attractiveness, or broader Europe, one can notice the attractiveness of large cities and their suburban areas that stand out on this map, while rural areas, especially peripheral ones, are still less attractive and are not subject to polarisation that allows investors to be interested in large or numerous investments, even in sectors based on the latest technologies, less susceptible to economies of scale.

Polarisation of space can occur according to different spatial patterns. It has a monocentric course when a leading industry sector in a given location is susceptible to large-scale benefits or when a given settlement unit has a significant urbanisation benefit. If a large city has developed in a given place and nothing disturbs the commercial functions of such a centre, the importance of individual poles, i.e. nodes organising the polarised region, grows with the growing scale of trade. If we deal with a city-forming function based on a raw material factor and a dispersed system of mine location, then the nuclei of groups close to each other are created, which gives rise to conurbations, or nodal regions of the dispersed type.

A polarised system may also have a linear form organised following the course of natural boundaries, e.g. along the coast, an example of which may be the Gdańsk agglomeration. Natural conditions organise changes to this spatial arrangement, as exemplified by the impact of the port in Gdynia on the creation of a bicentric region in the Gdańsk agglomeration. This example also shows the significant role of state policy and the use of the investment potential of a given place. The construction of the port in Gdynia is a good example of the investment attractiveness of this place in the interwar period.

Polarisation can also take place by increasing the intensity from the outside of the pole to its centre and vice versa, according to the stage of urbanisation processes. In the urbanisation phase, centripetal tendencies prevail, as exemplified by investment placement in the central part of the city, then in the suburbanisation phase the importance of suburban areas especially attractive for investments requiring mechanisation of works and convenient access for numerous suppliers and recipients increases. In the final phase of re-urbanisation, the importance of the centre may grow again, especially

in the phase of expanding multi-storey construction serving as a location environment for small businesses based on the benefits of diversity. At this stage, the development of post-industrial areas in the form of brownfield and the creation of new multifunctional centres accelerating the revitalisation of degraded post-industrial areas brings significant benefits.

Growth poles are usually places with high investment attractiveness, which results from higher growth dynamics compared to the environment and visible above-average socio-economic effects, expressed through measures reflecting various aspects of the socio-economic development. Poles polarising the regional space do not always cause an increase in investment attractiveness, which leads to the weakening of the self-perceiving effect of the investment attractiveness of regions with a traditionally high rating. It is due to the currently high bargaining position of enterprises in the direct investment market. It can be said that large corporations even impose the polarisation of a given area, indicating which locations they consider attractive or increasing their attractiveness due to the promise of generating jobs in a specific place, where it will be counted as an economic success, regardless of durability of the generated jobs and income transfer.

The problem is that the areas polarised by companies independent of the state implement their strategy, not always taking into account the good of their local or regional environment. It is because the management of a given company is obliged to respect the owners' interest, and thus higher puts the benefit of the production units located in the investor's country of origin than in the foreign branch, even when it is highly profitable and provides stable growth prospects. Therefore, ultimately, the attractiveness of a given place does not have to be adequate to real business opportunities occurring in a given place, resulting from cross-links and polarisation in a given place, but it can be reduced. Such a situation may occur if resources allowing for economic development in a given region have been exhausted, and growing barriers are not levelled in accordance with infrastructure overloads related to exceeding the thresholds for development. There may also be a slowdown in development or even a recession as a result of adverse phenomena of a natural or social nature (e.g. uncontrolled inflow of population not adequate to the capacity of a given settlement centre).

In turn, places with a low concentration of resources or market capacity may be more attractive due to the system of economic incentives. It is particularly true for sites with tax incentives or attracted by local business activity zones. Therefore, the actual distribution of growth poles can be a reflection of not only the processes of concentration of production and population, but can also be found in places perceived by investors as attractive for other reasons.

Polarised regions in Poland

Growth poles are usually big cities with their suburban areas. This type of conclusion flows, among others, from E. Wojnicka's research, which determined the growth poles in Pomorskie and Podkarpackie Voivodeships based on data from the first decade of the 21st century.

The author took into account the following variables:

1. Population income – average gross income per capita in 2000–2006 with Poland's average equal 100, as well as the dynamics of this income.

2. The income of the population at the level of gminas was estimated on the basis of the gminas' income from the tax on natural persons by dividing these inflows by the product of the gminas' share in the tax in a given year and the effective tax rate on natural persons.
3. Entrepreneurship – change in the number of business entities in the REGON register in the gmina in 2006 as compared to 1995, and the number of business entities per 1000 inhabitants in 2006.
4. Profits of companies – legal entities – gross income of enterprises per capita in 2005–2006 estimated from gmina income from corporate tax and average dynamics of this income in the years 1999–2006.
5. Labour market – average dynamics of employees in the gmina in the years 1995–2006 and reverse dynamics of the unemployment rate in the poviat of 2006–2004.
6. Balance of migration – net migration of population for permanent residence to the gmina in the years 1995–2006. The calculated series of variable values for individual gminas were standardised to enable their joint analysis. (Wojnicka, 2007: 17).

Based on the results of the research for Pomorskie Voivodeship, E. Wojnicka identified growth poles in the form of the Gdańsk agglomeration together with the surrounding gminas. According to the author, "It can be estimated that in the Pomeranian region there is a process of concentration of strong growth in the Tri-City metropolis and its diffusion to the neighbouring gminas". In turn, in 2004–2008 the strongest growth poles in Podkarpackie Voivodeship were formed by the poviats of the Rzeszów metropolitan area, as well as single gminas with industrial functions (e.g. Leżajsk, Stalowa Wola, Sanok, and Mielec) and tourist centres (Iwonicz-Zdrój, Cisna) (Wojnicka-Sycz, 2012: 46–47).

Polarisation of the Polish space was also the subject of research by other authors, but all of them confirmed that large cities and their agglomerations are development poles. W. Gaczek indicates that in the years 2005–2012 "an obvious advantage prevailed of the economic growth of sub-regions of large cities over the peripheral areas of the country. Differences between the agglomeration centre (urban poviat) and adjacent areas in most of the seven agglomerations examined did not decrease. The greatest differences occurred in the geographic proximity of economic entities between Wrocław and the Wrocław subregion, and between Warsaw and Warsaw's eastern subregion, as well as between Szczecin and the Szczecin subregion. There were also significant differences between subregions of large cities and adjacent subregions regarding the unemployment rate and geographic proximity of entities in the service sections K, M and N." (Gaczek, 2015: 28)

The study was based on the following variables: (1) gross domestic product per capita, (2) gross value added (GVA) per employee, (3) gross value of fixed assets and capital expenditures in enterprises per capita and sq km, (4) population density and density of working population, (5) number of total economic entities and entities of selected sections per area unit, (6) average gross monthly remuneration, and (7) value of sold industrial production per capita.

This coincides with the investment attractiveness map. The differences between the polarisation map and investment attractiveness are limited to only a few categories of places:

- Centres which can become poles are a place of business in transport hubs, where the local labour market has not developed, and income from business activities is discharged in the place where it is conducted. In this situation, the polarisation of a specialised nature precedes the creation of favourable conditions for attracting investment (lower investment attractiveness compared to the degree of polarisation),
- The centres are not poles if the potential of a given place has not been activated, for example by the lack of sufficient promotion of the place and its poor recognition or strong barriers to the development of local entrepreneurship or weak pro-entrepreneurial attitudes.

The factor influencing both the polarisation and the investment attractiveness are regulations leading to the disruption of competitive conditions in the form of areas privileged concerning tax. In Poland, these are regulations concerning special economic zones that are dynamically spreading all over Poland, but with uneven intensity in individual regions. It is known that most of them are in the regions with the strongest industrial traditions (Dolnośląskie Voivodeship), and the least in the regions with the lowest level of economic development, that is the opposite to the primary objective of their creation. Special economic zones can simultaneously enhance polarity and investment attractiveness, especially when they are created in the areas with unusually high location values. Besides, they may generate income and entrepreneurship that is ahead of the creation of the primary location advantages.

Economic subzones are located both in suburban areas of large cities or urban complexes, as well as in unattractive places, where the zone has been created for specific properties in the form of, for example, warehouses that are competitive due to a short time in which it is possible to adapt them to new functions. Even the best-prepared investment areas in desirable locations require time to start to generate profits, whereas in the era of generally smaller physical distances, the importance of economic distance and time distance is increasing.

Therefore, the question arises whether the creation of locational advantages and increasing investment attractiveness strengthens already existing growth poles, thus leading to further spatial concentration of economic activity in Poland, or rather a tendency to de-concentrate is visible, as a result of the increase in investment attractiveness of cities up to 100,000 inhabitants, constituting centres of at most sub-regional character, or as a result of the expansion of influence zones of big cities along the urbanisation paths. An attempt to answer such a question requires analysis at the gmina level because only on this scale it is possible to capture the impact of economically privileged areas or the influence of economic entities on the development dynamics of the various taxonomic regions. In the literature, analyses at the gmina level have appeared, but they often refer to the selected aspects of polarisation, for example to metropolitan processes, omitting the influence of the enterprise sector on the creation of growth poles (this group includes: Gaczek, 2010; Herbst, Wójcik, 2013).

Research based on a comparison of models built for each year separately and in relation to subregions or poviats, therefore, should be supplemented with analyses at the level of gminas. At this level, using several years' periods of time reflecting investment cycles, it is possible to identify the areas developing faster than their regional surroundings and thus achieving basic income, professional and economic effects.

Identification of growth poles

Based on the identification of growth poles with the local government unit, which shows faster economic development than the higher-order territorial unit (NUTS+1), it was assumed that if the territorial range of the gmina corresponds to the poviat, the reference unit is a taxonomic unit two ranks higher, i.e. subregion, and if the gmina corresponds to the poviat and the subregion at the same time, then the reference point is the voivodeship (NUTS2).

To identify growth poles the following variables were used:

1. business activity indicator – some entities registered in the REGON system per 1,000 people of working age,
2. employment rate – the number of people employed per 1,000 people of working age,
3. affluence ratio – a sum of shares in taxes constituting revenues of the state budget, personal income tax and shares in taxes constituting revenues of the state budget, corporate income tax per 1 person of working age.

The criteria for delimitation were as follows:

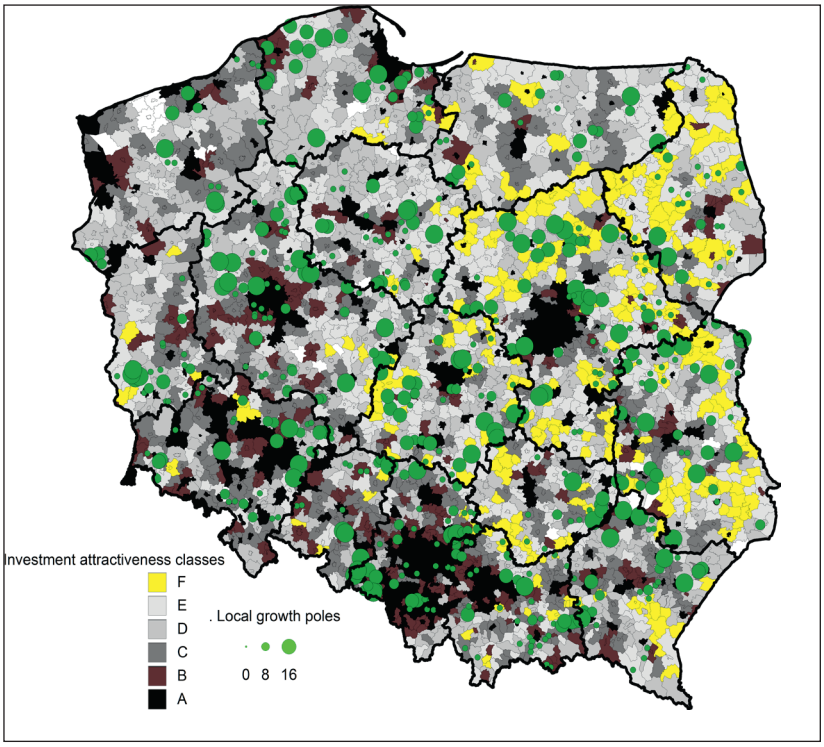
- the level of average annual dynamics of changes in the economic activity indicator in the analysed period and a comparison with the reference level (Z1);
- the level of average annual dynamics of changes in the employment rate in the analysed period and a comparison with the reference level (Z2);
- the level of average annual dynamics of changes in the rate of affluence in the analysed period and a comparison with the reference level (Z3).

The study was conducted in the following four five-year time periods: 2008–2012, 2009–2013, 2010–2014 and 2011–2015. This approach allowed for capturing the investment process in individual territorial units and the essential elements of the pole's impact on the local economy (entrepreneurship, professional activity and income effects) (more on the method: H. Godlewska-Majkowska, A. Komor, M. Typa, 2016). The results of the application of this method are presented in Fig. 1.

Local growth poles were defined in particular five-year periods. If all three components of the final ratio in a given period were above the value in the reference area, then the given commune was considered as a pole. If this occurred in only one period, then the pole received 4 points, if twice – 8 points, if three times – 12 points, and if four times – 16 points, i.e. the maximum rating, which means that in the entire period studied, the unit emitted more intensive developmental stimuli than the reference area, representing its regional or local surroundings, depending on its size.

In Fig. 1 we can see the existence of a cluster of growth poles in suburban zones of big cities, which shows that large cities delegate their development functions as part of the succession of city-forming functions. The poles also form along with essential communication routes thanks to the benefits associated with a convenient communication location, as well as in the gminas hosting special economic zones in their area. What is surprising, the map is missing large cities, even though they are strong economic centres. For example, Warsaw achieves better results regarding entrepreneurship development and an increase in economic activity of the population in relation to Mazowieckie Voivodeships. However, it has worse effects concerning tax revenue per capita. The same applies to Krakow and Łódź, which are the most significant Polish cities after Warsaw.

Fig. 1. Local growth poles in the years 2008–2015 against the investment attractiveness of gminas in Poland in 2015



Source: own work based on the databases of the Institute of Enterprise

In Figure 1 we can see also differences between local units, based on assessment of potential investment attractiveness. Potential investment attractiveness is defined as a set of regional location advantages that influence achieving investors' goals (such as costs of running a business, sales revenues, net return on investment and investment's competitiveness).

Investment attractiveness index is based on weight-correlation method, allowing determination of weights of pseudo-attribute variables such as demographic factor, social and technical infrastructure, administration, economic market.

Investment attractiveness index PAI1 ranges from 0 to 1. Classes have been defined for the purpose of comparative analyses. Their scope has been described by left-closed intervals with the following lower bounds:

class A: $Av + S(x)$,
class B: $Av + 0.5S(x)$,
class C: Av,
class D: $Av - 0.5S(x)$,
class E: $Av - S(x)$,
class F: 0,
where:
Av – arithmetic mean,
$S(x)$ – standard deviation. For further details see: H. Godlewska-Majkowska (2012).

The distribution of growth poles against the diversification of potential investment attractiveness allows us to observe certain regularities. Considering the occurrence of growth poles in the following five-year periods in 2008–2015, it can be noticed that they have the most durable character in the places of unusually high communication quality (Stryków – motorway junction), location along expressways (gminas between Słupsk and Tri-City), and along motorways (e.g. Kowalewo Pomorskie in Kujawsko-Pomorskie Voivodeship). Sometimes this is accompanied by revitalisation, such as, for example, in Zaleszany Gmina located along the national road 77.

The spatial layout of the most stable growth poles, i.e. those that emitted development stimuli throughout the analysed period, indicate that they are often located in the suburb zone of large cities, in the areas with high investment values (often of class A or B), as exemplified by the identified poles, e.g. Rokietnica near Poznań, Radziejowice in Żyrardów Poviat which is part of the Warsaw agglomeration, and Dąbrówka near Radzymin. These examples show the development of growth poles along the arms of urbanisation. In the vicinity of Wrocław, similar examples are provided by the rural gminas of Zawonia and Oława, as well as the rural-urban gmina of Jelcz-Laskowice. It is also possible to see growth poles whose development is triggered by special economic zones. These include gminas of Legnickie Pole and Jelcz-Laskowice, as well as Nowe Skalmierzyce.

Interesting is also the phenomenon of permanent development effects of gminas included in the lowest classes of attractiveness (e.g. F and E municipalities). These include the following gminas: Masłowice, Ciechanów, Trzebieszów, Klukowo, Kościelec, Kawęczyn, Mieścisko, Radowo Małe, Zawonia, Cisek, Prostki, Kruklanki, Żarnów, Czerwin, Międzyrzec Podlaski, Wysokie Mazowieckie, Waśniów, Łoniów, and Chrostkowo, as well as urban-rural gminas of Drzewica (3) and Wyśmierzyce (3). Their unique development in 2008–2015 has an impact on investment attractiveness, and probably shortly it will be possible to notice their advancement on the map of attractiveness.

The analysis of the map, therefore, shows that there is no direct relationship between the distribution of local growth poles and the distribution of large cities. Instead, it should be pointed out that they appear in places where extraordinary opportunities arise associated with new roads being built, or the depletion of investment areas in large agglomerations, thus more distant areas, but still within the isochrone of 60 minutes travel time to work, gain attractiveness. Other researchers also came to similar conclusions (f. e. Dębski, 2002, 2003; Instytut Badań nad Gospodarką Rynkową, 2007).

An important role is also played by companies making investments in special economic zones and places subjected to revitalisation processes, allowing the generation of new jobs, the increase of entrepreneurship and increase of income for the local population. It mainly applies to gminas under the influence of the Wrocław agglomeration and the Legnica-Głogów Copper District. However, this does not change the fact that big cities still maintain their strong position as growth poles, as evidenced by studies devoted to particular regions (more: Kudełko, 2016).

Management of investment attractiveness as a task of regional and local authorities

Shaping the investment attractiveness of the regions is a task that supports the coherent spatial development character of a given region, country or group of countries. If we refer to Poland, then it can be pointed out that the concepts of spatial development

of the country have long been presented with the view that we should strive for bandnode development with moderate polycentrism, in which excessive concentration of economic activity in big cities is not allowed, but rather development opportunities for all Polish regions are created, striving for coherence of the created spatial structures, thanks also to the adaptation of the transport network to the needs of sustainable spatial development.

If we accept such assumptions, the question arises whether the investment attractiveness supports the desired direction of polarisation in the spatial development of the country. The analysis of changes in investment attractiveness shows the strengthening of the largest cities and the agglomerations they create on the maps of investment attractiveness, while the development of new poles is rare.

From the observations made in the period 2008–2015, it can be stated that the most attractive investment gminas included agglomerations of Warsaw, Katowice, Krakow, Łódź, Poznań, Szczecin, and Tri-City, which was associated with numerous location values of big cities and their urban complexes. The lowest investment attractiveness was demonstrated by gminas in eastern Poland, in particular, the Lublin, Podlasie, eastern Mazovia and eastern Subcarpathian regions.

Changes in investment attractiveness are the result of the certain inertia of the processes creating location assets, which results from the long-term nature of public investments and the impact of the gained experience in obtaining external financing for further investments. Thanks to the learning process and the reputation of big cities as places in which it is worth running a business, there is a natural limitation of the set of considered locations to a group of places relatively well known to investors or to places where investors who are a role model for others have already made investments.

This mechanism based on investors' behaviour explains why there is a positive effect of cumulative causality in places attracting investments, and with the negative cumulative causality in places that cannot interrupt the process of growing development barriers.

The consolidation of the current trends in creating the most attractive places also results from the persistence of permanent criteria as the leading location decision making process. The market factors, i.e. the size of the market and its dynamics, remain the leading criteria for the location. Since market factors are of the most vital importance, it becomes apparent why large agglomerations as markets and places with excellent communication with other cities of the same or higher size class maintain their attractiveness until they reach the limits of growth or succession of some functions in favour of their surroundings.

It is challenging to stand out for smaller centres located outside the zone of influence of growth poles. Therefore, changes allowing the implementation of the concept of polycentric development of the country may be achieved by initiatives supporting the development of investments based on endogenous growth factors. Valuable are all solutions supporting entrepreneurship – preparation of the offer of investment areas for the needs of local business environment along with business incubators, dissemination of business knowledge, organisation of initiatives supporting business networking, marketing activities or thoughtful creation of institutions that support attracting investment not only to a specific centre but also to a group of potential partners in the form of other settlement units or organisations. A public-public partnership, private-public

partnership and active management of local development financing are examples of auxiliary activities.

Summary

This study aimed to show how the polarisation of economic space can modify the investment attractiveness of regional space. Considering the fact that the polarity of space can be studied in various ways, it is worth emphasising that the literature prevails in the opinion that space poles, not only in Poland but also in other parts of the world, are large cities and that they naturally increase the polarisation of economies in different corners of the globe. Investment attractiveness is its reflection, as the most attractive areas are metropolitan areas and industrial or tourist centres. Nevertheless, on a local scale, these processes may be disturbed by spatial separation of jobs from population distribution or tax settlement. Developmental stimuli may be blurred, and the spheres most affected by local or regional development may shift away from agglomeration centres.

The study shows that growth poles of permanent nature are created at a distance of several dozen kilometres from large cities. It indicates the depletion of development reserves of large cities and medium-sized cities, especially those with extensive space management. Location centres are becoming smaller, mainly located in the vicinity of communication routes, where access to investment areas and lower costs of running a business attract investors. Special economic zones are also located in such places, giving benefits to investors interested in creating their value chains based on the existing connections. Often they are not interested in creating networks based on local suppliers and recipients. It gives the mosaic character of polarised space.

The poles and their clusters are usually formed by large agglomerations and industrial centres in the development phase. These are usually places with high investment attractiveness, but there are exceptions. In every investment cycle, there are periods of transitional opportunities for regions with lower investment risk, where less complex projects are more rational and reliable. Also, new markets may open that require other elements to build investment attractiveness. The changes in attractiveness can be adjusted by the strength of inertia of the processes that create location assets, including management decisions of large enterprises, local authorities and the state government. Polarisation of economic space thus influences the increase of the investment attractiveness of the regions, strengthening the succession of economic production and service functions in the zones. A considerable role in these processes is played by investments in road infrastructure and revitalisation processes supported by special economic zones.

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Polish Geography of Industry in Sea Research

Abstract: Industry, still one of the most significant sectors of the economy, is undergoing permanent quantitative and qualitative changes. Therefore it should be the subject of not only business analyses, but also research which more broadly explain our reality in the environmental, social and economic dimensions, noting the more and more complex relations between the elements, sets and even entire systems functioning in various spatial arrangements. The research on the changes in industry structures implemented by Polish researchers representing various fields of science has been an essential element of the cognitive process for many years. Among them are also geographers for whom the spatial aspects (the characteristics and issues) of industrial activity seem particularly significant. However, the issues handled by them mostly regard land areas. Therefore, there is also a strong need for wide-range theoretical and applicable research on the identification of sea and coastal areas functioning on the basis of diversified industrial structures, using the previous academic achievements, including the achievements of the Polish economic sea geography.

Keywords: economic geography; industry; sea research

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Introduction

Structural changes of industry, which undoubtedly influence changes in geography of industry, encourage discussion on the state of this geographical sub-discipline, including its current problems, research issues and its place in economic geography, and in geography in general (Rachwał, 2008; Stryjakiewicz, 2010). In the context of the ongoing socio-economic processes, as well as administrative and legal decisions, the question about the role and importance of geography of industry among the sciences researching the functioning of industrial structures seems particularly essential (Czapliński, 2008). The evaluation of geography of industry regarding its application and related marketing of scientific and research services is also important. Unfortunately, this evaluation,

especially in comparison to economic sciences, is very poor (Łoboda, 2004, and many others). Therefore, it is necessary to extend and promote the diagnostic function of geography of industry, and even more so its prognostic function, which seems to be underestimated by geographers themselves. It should be emphasised that for economic geography, including geography of industry, to further develop it is above all necessary to redefine research priorities. In this context, a return to the geographical and economic research of the sea, under which studies in geography of industry would be undertaken, needs to be considered significant. There is a growing interest in industrial activities at sea and in particular the exploitation of known and new submarine places of occurrence of raw materials. The demand for offshore electricity is growing by its various properties. The demand for industrial products for service sector departments is also growing, both in the coastal areas, as well as in the open sea (e.g. maritime transport). Recognising the ongoing economic processes, it is also worth paying attention to the growing competition between representatives of various sciences for the primacy in the socio-economic research of the sea, which gives many tangible benefits. It seems that geographers cannot be missing in this rating. Therefore, there is an urgent need to verify the current state of geographical and economic knowledge about the sea, and on its basis to identify the challenges facing economic geography, including geography of industry, in the field of marine research. It is mainly related to defining the thematic scope of the sub-discipline and the primary object(s) of research, methodological trends and directions of research, looking at the problem of locating economic activity at sea, and the place of industry in contemporary spatial processes. In turn, it may contribute to the development of analytical research and attempts to build own theoretical assumptions using not only foreign patterns but also the achievements of Polish geographers. It gives a serious argument regarding self-identification of economic geography, including geography of industry.

Research conditions

Researching geography of industry which in its substantive and spatial scope would concern the broadly understood maritime issues is currently a difficult task. It results from many premises, but one of the most important seems to be the terminological one[1], which concerns not only the very term 'industry' but also concepts describing it, such as, for example, sectors, branches and industries[2]. It should be emphasised that due to the disappearance of the division of economy into three sectors, there is a growing difficulty in defining the scope of the subject of geography of industry, and perhaps the entire economic geography. As Stryjakiewicz (2010: 31) remarked, "the problems of old geography of industry blend in with the research in the field of economic geography (taken as a whole, i.e. without a sector division)". However, it carries certain consequences, sometimes leading to unjustified abuses, especially in the services sector (e.g. cultural industries) or at least doubts when, for example, maritime transport and logistics, maritime science and education or maritime tourism (e.g. Grzybowski, 2009) are

[1] The study deliberately omits terminological considerations at the level of geography as a science and its division.

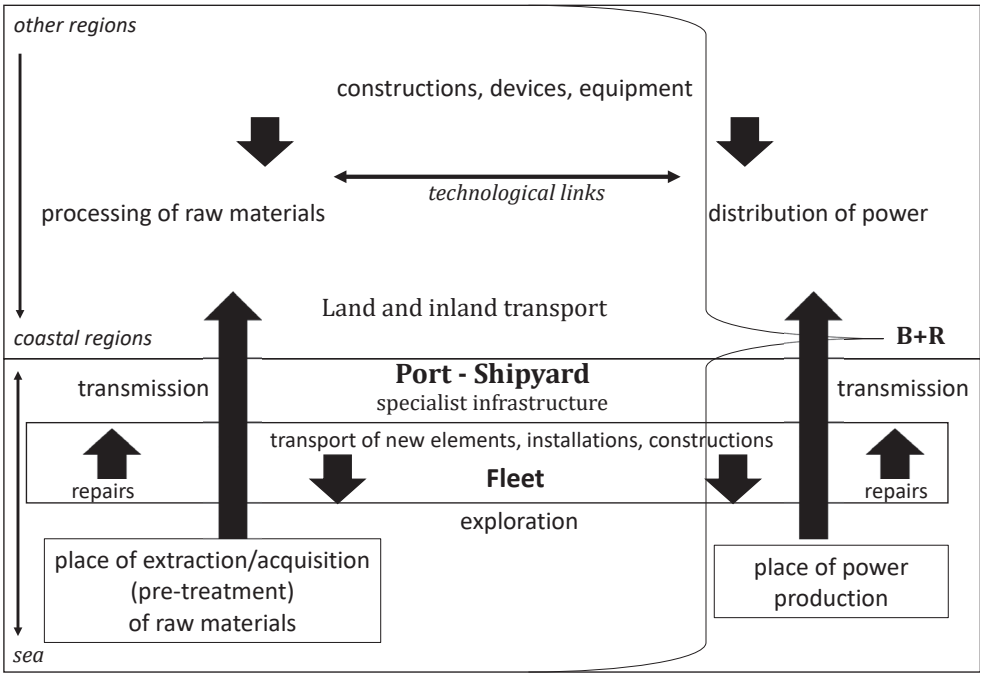
[2] From the point of view of the classification of economic activity in force (PKD 2007), there are 34 branches of industrial activity, while the concept of further subdivisions does not exist. Their widespread use is associated with the classification KGN outdated for more than 20 years.

included in maritime industries. Perhaps it is due to the erroneous historical perception and definition of maritime economy treated *en bloc*. It is confirmed by the definition of maritime economy proposed by Salmonowicz (2010: 2). The author decided that it is "every economic activity (...) which can be carried out only because there is a sea, but it should be borne in mind that it is a complex activity, consisting of many activities and processes, whose common denominator is the use of the sea and its neighbourhood (e.g. the coastal zone) as the key resources in this activity". Such a broad substantive scope of the concept of maritime economy (which also includes the concept of industry at sea, although it does not exhaust it) meets the EU's uncritically disseminated administrative terminology, and consequently allows the implementation of application objectives related to the possibilities of obtaining EU funds. In this way, however, the actual picture of the various components of the maritime economy is blurred, generalised and seemingly homogeneous. It is difficult, however, for an unambiguous, coherent arrangement, since for many years it has not been determined legally and administratively.

Another critical problem of the geography of industry is the increasing difficulty in defining the primary research object because the maritime economic activity is usually not one industrial enterprise, but the production chain (Fig. 1), which more and more often fits into global economic networks.

The proposal of the relational approach as the necessary methodological approach in the research of the offshore industry is important. However, it does not exempt from the discussion on the necessary decisions concerning, among others, the spatial extent of the operation of industry at sea, which results, inter alia, from legal, administrative, investment and reporting premises. Adopting the criterion of the place of business

Fig. 1. Production chain at sea



Source: Czapliński (2015: 106) – modified

activity and the division of industry into the seagoing industry (exclusive economic zone), seashore (internal maritime waters and territorial waters) and coastal (coastal regions) seems to be far imperfect. Apart from the signalled complementarity of undertaken actions on land and sea (in its various parts), which from a technological and organisational point of view is an increasingly less critical barrier, the very course of borders (also terrestrial ones) raises serious doubts. Therefore, in solving this problem, it would be more important to adopt specific industrial activities as a criterion for the place, recognising that maritime industry is an economic activity offering production solutions, such as mining raw materials, obtaining other resources and their pre-processing and energy production on and from the sea. A place defined in this way should be identified with the concept of industry at sea (maritime industry) in the narrow sense of the word. Maritime industry in a broad sense could be based on the product criterion, and its definition could apply to all products and semi-finished goods of material nature whose use takes place at sea[3].

Another critical problem of geography of industry associated with marine research is location factors and location benefits. As a result of the intensification of economic activity at sea, the existing assumptions concerning the place of their location should be verified (Adrjanowska, 1977, 1985). It is due to the arrangements above for the networking of the economy, but also to new types of activities emerging at sea (maritime energy, mariculture), new technologies for obtaining raw materials (mining of rare earth metals) or social processes occurring among the population associated with economic activity at sea. In the light of the above, the entire catalogue of industrial location factors should be revised and referred to maritime environment, so different from terrestrial areas regarding, for example, spatial scale, accessibility, borders, the role and location of the human factor and the specificity of sea waters and the seabed.

An equally important and demanding new arrangement seems to be the issue of the forms of concentration of economic activity at sea, and, more precisely, an attempt to develop a comprehensive typology of local production systems, including their spatial scale based, for example, on Porter's cluster theory (Porter, 1990). It seems justified to state that the existing attempts to classify the phenomenon are not satisfactory. What is more, it seems that due to the maritime specificity of the problem, the formation of production systems in precisely defined locations is characterised by specific local conditions.

One of the significant obstacles to this task is the well-known problem of availability, detail, consistency, reliability and quality of information contained in available databases. It does not concern only the described issues but research in general. In geography of industry, this results in data fragmentation which significantly affects the possibilities of researching dynamic terms and comparative research, and consequently results in building generalisations. This growing formal problem causes that some researchers abandon the hitherto directions of research, and therefore there are niches of knowledge rarely penetrated. It applies, among others, to enterprises whose activities are related to the sea.

[3] An attempt to introduce enumerical definition on the basis of, for example, PKD 2007, seems to be even more complex. It is due to the fact that the offshore industry would not only be included in sections commonly recognised as industrial (especially divisions 25–28 and 32–33), but partly also in other sections. This causes certain descriptive and statistical difficulties. The question is also whether the offshore industry should be treated separately.

The psychological factor should also be added to the outlined research conditions of geography of industry, including the specifics of its research at sea, which relate to selected substantive and formal problems. Its meaning can be reduced to two characteristics which should describe the research community. These are widely understood activity and openness to the environment (including research activities of other researchers, scientific discourse and an attempt to reach a compromise). It is indeed a problem of science in general, but due to the relatively small group of Polish geographers of industry this problem seems particularly important, but at the same time solvable.

Outline of Polish geography of industry in sea research[4]

In the historical development of the geography of industry, also in the part devoted to the problems of the functioning of industrial structures in the coastal regions, the coastal zone and the high seas zone, several research periods can be distinguished. According to Dutkowski's (2018) proposal, the first of them, pre-war, was the initial period in which the studies were mainly descriptive-statistical. An example of a geographical achievement from this period is the publication of Walenty Winid entitled *The Industry of the Free City of Gdańsk* (1938) which was published in the Geographical Magazine. It was not the first study dealing with the industry in Pomerania at that time, but it had a geographical origin and character.

The second research period falls on the time of intense development of the Polish maritime economy in the times of the People's Republic of Poland. It was then that we could talk about the real development of the geographical research of the sea, including research in the field of geography of industry. The Gdańsk geographic centre should be considered a research centre during this period. It is there that numerous studies devoted to the problems of the sea industry were published, the most substantial number of which was devoted to the shipbuilding industry (incl. Kurkiewicz, 1964; Bieliński, 1970, 1987; Adrjanowska, 1971, 1984; Wojewódka, 1979) and fishing industry (incl. Kulikowski, 1952–1954; Kowalewski, 1962; Daszkowska, 1970; Musielak, 1976, 1984), which results from the unique role these industries played in the structure of industry in coastal areas. Following the post-war achievements of the Gdańsk centre in the field of industrial research, we note a gradual shift from the traditional descriptive-statistical direction, through technical-economic and physiographic to theoretical-methodological or synthesising approaches (Portalski, 1998). In this context, the scientific achievements of E. Adrjanowska deserve particular attention. They focused mainly on the issues devoted to the factors and barriers of the location of industry at sea and in the coastal zone (Adrjanowska, 1977, 1985, 1992), as well as geographic-economic research of spatial relations of industry in the coastal zone (Adrjanowska, 1971; Adrianowska, Niesyt, Skupowa, 1990). It is also important to recognise the achievements of A. Piskozub who attempted to construct a model of location of industry in the Polish

[4] The presented rough outline of the research topic of geography of industry in marine research is based solely on available published sources and therefore does not include various types of expert opinions and a large section of the work carried out as part of nodal problems, undoubtedly important for the full assessment of scientific achievements. It should also be emphasised that the presented output is not a full review of the literature in the field of the discussed issue. These publications are aimed only at closer identification of specific research directions.

port-urban complexes (Piskozub, 1973, 1980). It is worth emphasising that in the discussed period some research traditions which were started in the Gdańsk centre are still being continued. This applies, among others, to the studies on the role of industry in shaping spatial and functional structures in the Gdańsk agglomeration (incl. Gaworecki, 1974, 1976; Dutkowski, 1978, 1981, 1986), the impact of processes in industry on socio-economic development on a global, regional and local scale (e.g. Portalski, 1977; Dutkowski, Mohammed, 1984; Musielak, 1986; Skupowa, 1986, and many others) and the idea of Baltic Europe in economic terms (Zaleski, Wojewódka, 1977).

Quite late, because only after 1960, geographers living and working in Central Pomerania (Rydz, 1998) joined the research in the field of the broadly understood geography of industry. Their primary interests include research on location conditions of particular plants and industries, evaluation of social effects of industrialisation, and the impact of industry on the development of urban space (Rydz, 1978). The vast majority of studies from this period concerns coastal regions. However, studies that directly refer to the role of industry in maritime economy and the sea as a place where industrial activities take place constitute a small group (Domagała, 1967; Przeździecka, 1976; Machura, 1982).

The third research period is connected with political changes, and consequently also socio-economic ones that have taken place in Poland since 1989. It is worth adding that at least in the initial phase it was a period of crisis of maritime economy, then its restructuring, and finally rebirth. In the new reality, geographers involved in industrial research began to undertake new research topics related to the spatial adaptation of the industry in the conditions of transformation, while maintaining their interests, however to a different degree, in all components of maritime economy and coastal cities and regions. During the transformational shock, a series of studies were created, in a sense as a continuation of the current problems adapting to socio-economic reality (Adrjanowska, 1990, 1992; Rydz, Zalewski, 1992; Musielak, 1994; Musielak, Małachowski, 1995). However, it soon turned out that the implementation of many studies cannot take the form and content common so far. Hence the studies was often contributory and descriptive, sometimes of very high but local significance (Białasiewicz, Gołębiowska, 1991; Portalski, 1992; Rydz, Jażewicz, 1996). However, from the very beginning, in the field of geography of industry, and especially in the studies concerning marine areas, the weakness of generalisation and international comparative studies was noticeable. An exception is the work of J. Musielak (1991), who aimed to analyse the theoretical and methodological problems of economic geography of the sea and to determine its place in the system of geographical sciences.

Since the 1990s, in geographical research on the functioning of industrial structures in the coastal regions and the high seas, the researchers' inclination towards a comprehensive geographic and economic analysis (without any division into previous industries) could be noticed. It resulted not only from the popularisation of the holistic approach in research and emerging new research problems but also from forced changes in research methodology, among others as a result of the shrinking access to data and the level of their aggregation (e.g. Musielak, Małachowski, 1996). In extreme cases, this resulted in the abandonment of the current scientific path by some researchers, which in turn became one of the reasons for the crisis in geographic-economic marine research in the field of geography of industry. The publications of geographers appearing at the turn of the centuries were few with a very diverse substantive, temporal and

spatial scope, maintained in the information and statistical trend, which did not support the building and development of previous theoretical achievements (Czapliński, 1999; Musielak, 2001; Wendt, Ilies, 2001).

In the last decade, there has been an apparent revival in geographical research on maritime industry. From the point of view of the applied research methods, it was possible to notice the transition from the information and statistical current to the analytical and explanatory one. There were also two very clear and characteristic tendencies regarding the research issues being undertaken. On the one hand, there was a renaissance of maritime issues still being practised in the times of the People's Republic of Poland, but in new social, economic and political conditions. It applies, among others, to shipbuilding industry (Dajczak, 2008; Palmowski, Tarkowski, 2016), fish processing industry (Czapliński, 2011, 2013) and the role and importance of domestic raw material resources from the bottom of the Baltic Sea (Wieloński, Machowski, 2008). On the other hand, there have emerged studies that respond to new phenomena and processes occurring in industry in marine areas. It is particularly true for offshore energy production (Czapliński, 2016) and offshore industry (Czapliński, 2015; Biniek, 2017). However, the rapid growth in demand for spatial and economic research of the sea, also dedicated to industrial geographers, is not accompanied by a marked increase in their scientific activity, including publications. There are also no attempts to generalise and apply new methodological approaches, e.g. evolutionary or relational, and all the mentioned studies from that period should be qualified for the analytical and explanatory current.

Research challenges

Perceived weaknesses in geography of industry in marine research require to set new goals for this geographical subdivision, of which at least some are scientific challenges. One of them is achieving a terminological compromise. The problem is much more comprehensive and seems to affect science in general, but in the case of geography of industry, including geography of sea industry, due to a relatively narrow group of researchers, it seems relatively easy to achieve in the short term. The above-mentioned psychological factor is relevant here. A prerequisite for practising the contemporary geography of sea industry is also interdisciplinarity. This is not a particularly new idea in the geographical and economic research of the sea, because from the period of the People's Republic of Poland there have been many examples of the complementarity of basic and applied research. Therefore, it is necessary to return to previous solutions and invite other researchers and not only geographers to study the geography of marine industry. It would significantly improve the cognitive process and also allow for the development of interdisciplinary methodological foundations. In the long-term perspective, it is necessary to recognise the proposed terminological compromise through co-authored publications (e.g. the textbook of marine economic geography, including geography of industry, and further consistent use of commonly agreed and accepted terminology.) The second necessary condition would be the organisation of cyclical interdisciplinary scientific meetings, which must become not only a place to exchange ideas but also a place for the creation of objective opinions and judgments, which will be heard by all market participants in the field of maritime economy. These vague and somewhat idealistic postulates have a chance of success, but only if the geographical,

scientific environment is much more integrated around the discussed issue, thus giving a clear indication of their identification on the market of scientific research services.

FINAL REMARKS

It seems that the contemporary economic processes at sea, especially their extent and spatial relations, will force the return of economic geographers, including geographers of industry, to this issue, the use of the current contribution to empirical research, as well as to the construction of theory. Its foundation should be the assumption formulated by Z. Zioło (2006), which states that the adopted economic rules (on a micro-, meso- and macro scale) that have a non-spatial character affect the directions of the geographic space development, in which the socio-economic space is included, including the industrial space created by individual enterprises that are in a very complex relationship determined by socio-economic and cultural conditions, which spatially can bring diverse effects. Therefore, a geographical perspective on the socio-economic reality seems to be a necessary condition for understanding the changes taking place. It applies in a particular way to changes at sea, as the specificity of the environment and the spatial scale enforces a different approach to the meaning of such concepts as location, border, distance and range.

In contemporary world, determined by the processes of globalisation, the free flow of information is growing. Its elements can and should be used in expanding scientific knowledge. However, one must be prepared substantively and emotionally to this change, because unreflective acceptance of new content can lead to incorrect diagnosis of problems, phenomena, processes and, consequently, erroneous perception of reality, including that at sea. Therefore, there is an urgent need for action to develop standard, interdisciplinary terminology in the whole of science, also involving geographers, to carry out the appeal of geographer F. Plit (2018): "we need to know what we are talking about". This seemingly obvious postulate seems to be quite complicated due to the increasing overlap between research fields of scientists representing various scientific disciplines, the growing number of para-scientific studies arising in the business environment, and the growing belief that scientific cognition has an alternative. All of these threats also concern the economic research of the sea. Therefore, it is necessary to increase the geographers' activity in the animation of the interdisciplinary scientific community dealing with this issue and to emphasise the geographical perception of economic reality, including the one at sea. The real geographic, scientific achievements authorise such activities, and at the same time oblige to undertake new research challenges on the dynamically changing economic space of the seas, especially in the planning and prognostic, cartographic and, in part, also raw materials current.

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Research Directions and Achievements of Polish Geography of Construction

Abstract: Although the second half of the 20th century is the period of development of economic geography in Poland, in the first post-war decades geography of construction did not function as a separate geographical subdivision. More significant development of spatial research in this field was brought about a quarter of a century ago. In the article devoted to the problems of geography of construction in Poland, the subject scope, main directions of research and the achievements of this sub-discipline are discussed. Geography of construction is a branch of economic geography, which examines spatial aspects of construction and assembly 'production', with special attention to spatial organisation of investment processes, as well as conditions and effects of location and spatial structure of construction investments. The literature review allows for isolating the main directions, among which the following can be listed: conditions for the development of construction of different functions, also in the context of the accompanying phenomena (e.g. in the social sphere), location factors and effects of construction investments, as well as research devoted to the spatial structure of construction projects and their links with geographical environment. Research topics of geography of construction are part of the spatial processes within the interests of other geographic sub-disciplines, as well as of related social, economic and even technical disciplines. The achievements of Polish geography of construction of the last quarter of a century are important from the point of view of a better recognition of the conditions and course of the socio-economic transformation in Poland in different contexts and different spatial scales.

Keywords: Polish geography of construction; research achievements and directions; subject of research

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Introduction

The second half of the 20th century brought dynamic development of economic geography in Poland, in particular geography of industry and geography of transport, both related to the material sphere of economic activity. However, Polish geographical

literature in the early post-war decades barely contained any reference to such a term as geography of construction. It was not until the conference of the Industrial Geography Commission of the Polish Geographical Society, which took place in Krakow at the turn of the 1970s and 1980s, that L. Straszewicz proposed the inclusion of a rather marginally treated theme of geography of construction. In the article published after this conference, when analysing the role of geography of industry in the system of geographic sciences, L. Straszewicz suggested:

"Specialists in industrial issues are sometimes limited in their research... only to the processing industry… On the other hand, construction is also rarely included in industry; in our planning and statistical practice it is generally thrown into a separate housing sector. In my opinion, despite many doubts and reservations, geography of industryshould include all these three sections (i.e. also mine industry), although they are characterised not only by the diversity of the subject matter, but also very different issues, and – what may be the most important– different research methods" (Straszewicz, 1986: 28).

The argument for such a solution to situating the problems of construction was that together with the processing industry it belongs to the second sphere of human economic activity and is subject to the same laws that tie construction with industry, especially industry of investment goods. The difference concerns the nature of the work and the type of a finished product which cannot be subject to movement and is quite a different merchandise on the specific service and real estate market. As L. Straszewicz writes, "in geographical practice so far no one has dealt with construction thoroughly, leaving this importantsector of the national economy beyond the sphere of interests of economic geography. I think, however, that there is no more serious reason our discipline (i.e. geography of industry – added by the authors) should not include constructionas a special phase of industry" (Straszewicz, 1986: 29).

This demand for broader integration of construction issues into geographical research within the sub-discipline of geography of industry did not receive much response, as evidenced by the very carefully reviewed achievements of Polish geography of industry at the end of the 20th century (Misztal, Zioło, 1998; Marszał, 2001). The next decades, and especially the last quarter of the century, have brought significant development of spatial research in the field of construction.

Taking the above into account, the article discusses several issues that relate to: (1) the scope of the subject and object of research of geography of construction, (2) the main directions of research carried out within this geographical subdivision in Poland, and (3) the achievements of Polish geography of construction.

OBJECT OF RESEARCH IN GEOGRAPHY OF CONSTRUCTION

Presentation of the achievements of geography of construction, and more broadly spatial research on the issues of construction, requires in the first place specifying the merits of the subject of research of this relatively young subdivision of socio-economic geography.

Construction is part of the national economy, in which purposeful and conscious human activity adapts natural resources for human needs through the implementation of construction projects. Construction investments are a specific kind of economic activity, the aim of which is to construct a building with specific utility characteristics

and in a specific place, as well as the reconstruction, extension and superstructure of a building[1]. The notion of a construction project, referring to the result of this activity, can mean the effect of investment. On the other hand, in economic terms, it can be understood as an economic burden incurred for maintaining, creating or increasing capital, which has the form of a construction object.

Construction investment, treated as a synonym of a construction process, is a complex and multi-stage activity serving the implementation of a construction project and includes not only the phase of physical implementation of a building, but also the necessary accompanying measures required by law, such as:

- development of a construction project (development of the plot, as well as architectural and construction project),
- obtaining an administrative decision enabling the commencement of construction.[2]

For construction plots or areas where construction is planned, it is necessary to design and implement appropriate development (before putting objects into service)[3]. The obligatory element of the construction process is the investment's characteristics including, in addition to the land development and building characteristics (design and dimensions of the planned structures), the legal status of the property (including planning as well as protection and conservation), technical infrastructure needs (availability of utilities), transportation accessibility, technical parameters and geotechnical conditions of the investment and its impact on the environment[4]. The key issue determining the construction investment is compliance of the construction project with the provisions of the local spatial development plan (or with the decision on land development conditions, as well as environmental protection requirements) and building regulations.

Construction objects – whose inherent feature is permanent connection to the ground (so they are unmovable) – may take the form of (a) structures, i.e. objects not singling out the inner space intended for living beings, but which are not objects of small architecture, (b) buildings, i.e. cubature objects with foundations and a roof, separated from space by means of building partitions and used for various purposes by man, and (c) objects of small architecture.

As part of such defined construction, the following can be distinguished based on the purpose and functions: housing (single-family, multi-family, and collective), service and municipal (technical infrastructure and small architecture), industrial construction, communication/road, agricultural and water (marine and inland).

Construction, understood both as the investment process and the effect of this process, is the subject of research of many academic disciplines falling within the scope of both technical and social knowledge. What makes geography stand out among them is conducting spatial analyses. Geography of construction is thus a branch of economic geography, which examines: (a) the spatial aspects of the construction and assembly 'production' (related to site preparation, raising structures and buildings, performing

[1] See Article 3 of the Construction Law Act of 1994.

[2] An administrative decision requires a change of land development consisting in the construction of a building or other construction works, as well as a change in the use of the building or its part, if there is no local zoning plan.

[3] Cf. Article 6 of the 1994 Construction Law Act.

[4] Cf. Article 52, Item 1, Point 2 of the Spatial Planning and Development Act of 2003.

installation construction, and execution of finishing works), and especially the spatial organisation of investment processes, and (b) conditions and effects of location and spatial structure of construction investments.

The above-presented definition of the research area of geography of construction, although its theoretical dimension should not raise doubts, in practice does not always allow assigning specific scientific achievements to a given sub-discipline. This is primarily determined by the nature of the construction activity, which very closely fits into the spatial processes remaining in the interest of other geographic sub-disciplines, as well as the related social, economic and even technical disciplines. An example can be geography of transport, industry and settlement, as well as spatial management and urban planning. Spatial analysis of construction fits perfectly within the issues of spatial development, revitalisation, location of investments, housing policy and many other issues often undertaken in an interdisciplinary approach.

This specificity of geography of construction had a key impact on the lack of its clear delimitation as one of the sub-disciplines of socio-economic geography; consequently for many years studies dealing with the issues related to the spatial aspects of construction projects were incorporated within related disciplines. An entirely separate and debatable issue is the problem of classification of studies devoted to manufacturing activities related to the production of building materials, which in itself is not a component of the construction process, but significantly conditions it and thus to some extent constitutes its extension.

The problem of construction defined as the field of human activity associated with the erection of buildings, including redevelopment, reconstruction, modernisation and conservation of the existing facilities, was prevalent in many studies published after World War II, although often mentioned briefly as part of settlements issues or the problems of selected business sectors. Although 'explicitly' not referred to as geography of construction, a series of analyses were in fact devoted to investment issues related to this geography sub-discipline, whose basic element is construction investments, covering both the industrial and infrastructural spheres, as well as housing construction.

Main research directions of Polish geography of construction

As previously mentioned, the classification of construction can be made, among others, based on its purpose and functions. Taking into account this criterion, it can be concluded that the housing construction has become of particular interest for geographers representing various academic centres in Poland, which results both from its importance for the national economy and the functioning of society. The complexity of problems related to this sector of the economy affects the fact that the subject of housing construction has been undertaken in many academic studies, as well as specialist and daily press, among others due to significant transformations that affected this sector in Poland during the period of the centrally planned economy, and then during the political and economic transformation.

Studies in the field of geography of construction include problems of housing development and changes in its spatial concentration (Tkocz, 1993; Gaczek, Rykiel, 1999; Marszał, 1999a, 1999c; Pieniążek, 2005; Milewska, Ogrodowczyk, 2006a; Tkocz, 2010; Stępniak, 2014). They also analyse the quantitative development of housing construction against the background of national policy in those terms (Marszał, Juraś, 1998;

Ilnicki, 1999a, 1999c, 2003; Juraś, Posatskyy, 1999; Marszał, 1999b; Marszał, Stawasz, 2006a, 2006b; Ogrodowczyk, 2015). The influence of spatial policy and changes in the construction law on the development of new housing construction is also underlined (Milewska, 2003a, 2003b; Borowska, 2011; Ogrodowczyk, 2011b). The specificity of construction, including its sensitivity to economic fluctuations, favours interest in the relationships that exist between housing and the economy, as well as the state's tax policy.

The emergence of new forms of financing and supporting the development of housing construction in the conditions of market economy means that analyses devoted to this sector also concern its changing investment structure, as well as problems in the management of housing resources, occurring especially in the new socio-economic conditions (Marszał, 2000; Marszał, Stawasz, 2006a, 2006b).

Important themes of analyses are still the directions of technological development in the construction industry and the problems of standard and technical equipment of housing resources and their exploitation, as well as problems of modernisation and revitalisation in connection with often unsatisfactory technical condition of residential buildings (Kozłowski, 2005; Słodczyk, Jakubczyk, 2005).

The issues of the location of new housing constructions in urban areas are rarely described in detail in the literature. They appear as part of wider problems, especially in the context of spatial development conditions of various types of housing, as well as in the area of acquisition of land for investment and selection of a detailed location of new housing, also in the form of housing estates (Gaczek, Rykiel, 1999; Słodczyk, Klimek, 2003; Wdowicka, 2007; Ogrodowczyk, 2011a). The directions of spatial development of housing, also in connection with changes in infrastructure of urban areas (Bartosiewicz, Turczyn, 2008) and the spatial structure of housing (Dzieciuchowicz, 2002; Milewska, 2008) are also analysed. It is worth noting that new housing construction is of interest for geographers in the context of its impact on social transformations taking place in urban areas, including processes of gentrification (Holm, Marcińczak, Ogrodowczyk, 2015).

The majority of studies in the field in question is related to the issues of housing development, structures of residential spaces and housing conditions of the population, especially residing in large cities and suburban areas (Dzieciuchowicz, 1974, 1975, 2002; Gaczek, 1979; Tkocz, 1992; Jakóbczyk-Gryszkiewicz, 1995, 1998; Ilnicki, 1996, 2001, 2006; Kaczmarek, 1996; Gotowski, 2003; Milewska, Molenda, 2004; Matykowski, Tobolska, 2005; Milewska, 2005, 2008; Ogrodowczyk, 2006; Milewska-Osiecka, 2010, 2011, 2015), as well as the broadly understood theme of value and the real estate market (Groeger, 2004), while publications on the housing development of medium and small towns are definitely less numerous. In particular, they deal with the topic of conditions for the development of housing construction, as well as the types of buildings located within these urban centres (Kaczmarek, 1991; Jażdżewska, 1998; Lamprecht, 2003; Konecka-Szydłowska, 2006; Zaniewska, Barek, 2005; Ogrodowczyk, 2005/2006; Milewska-Osiecka, Ogrodowczyk, 2006b) and implementation of various types of construction projects in their areas (Milewska, Turczyn, 2005; Turczyn, 2005, 2016; Durecka, Durecki, 2015; Węcławowicz-Bilska, 2015). If compared to the studies referring to the problem of housing construction in cities, those related to national scale (Marszał, 1999b; Ilnicki, 2003) are not numerous.

In the second half of the 20th century, construction investments with an industrial function were the object of interest of geography of construction, among others in the context of their planning (Knyziak, Lissowski, 1964), location (Opałło 1963, 1978), and the development of the building materials industry (Gajowski, 1958; Misztal, 1958; Najgrakowski, Grzeszczak, 1959; Grzeszczak, 1962, 1964; Bolkowski, 1966, 1968). Research in the field of industrial investment development was often conducted not only at regional, but also national level (Szerwentke, 1962; Balcerska, 1971). In geographical literature, the location of industrial investments is also undertaken (e.g. Kistowski, 2012).

Publications in the field of geography of construction are also devoted to the issues of construction investments with a service function (in this case, it is possible to talk about close links with the object of research of geography of services). One can distinguish those that treat the services sector as a whole, not taking into account its differentiation (Śleszyński, 2006; Nowak, Turczyn, 2009), and those in which attention is devoted to the selected objects, e.g. based on a functional criterion (Micek, 2003; Gwosdz, Sobala-Gwosdz, 2008; Stryjakiewicz, 2009; Kowalski, Wiśniewski, 2017).

A large group of studies from the discussed topic is devoted to the problem of construction investments with various functions, especially in urban areas (Broniewski, 1978; Marszał, 2003; Śleszyński, 2008; Jarczewski, 2008). Geographical research on this subject, conducted during the centrally planned economy, concerned, inter alia, distribution of investment expenditures (Eberhard, 1975), but the issue of location of the investment and its conditions was a particularly important issue (Pyszkowski, 1976; Zajda, Szlachta, 1982). Contemporary studies in this field have quite a diverse subject matter – they relate to, among others issues, the structure of implemented investments and their impact on urban development (Bartosiewicz, Turczyn, 2008), acquisition of new investment areas (Mazur, 2005), as well as social effects of investment implementation (Szmytkowska, 2003; Bednarek-Szczepańska, Dmochowska-Dudek, 2016). It is worth emphasising an increased interest in investments in the field of communication/road construction (Komornicki, Śleszyński, 2009; Rosik, 2010; Ciechański, 2013; Rosik, Kowalczyk, 2015; Komornicki et al., 2015).

Taking into account the scope of the issues of the discipline defined in the article and studies undertaken by geographers in this regard, we can distinguish some research directions of geography of construction in Poland, focusing on the following issues:

- conditions of the development of construction of different functions both at national and local level (with particular emphasis on legal and institutional conditions);
- development of construction, especially in the context of phenomena accompanying this economic activity, including those in the sphere of social cohesion;
- location factors and effects of construction projects with different functions;
- spatial structure of construction projects;
- relationships between construction projects and the surrounding geographical environment.

Among the publications that can be listed as achievements of geography of construction are also studies addressing theoretical and methodological issues, with this current of research being rather poorly represented in Polish literature of the subject. Geography of construction, as a young sub-discipline of geographical sciences, in the field of theoretical approaches and research methodology utilises in a broad sense

achievements of socio-economic geography and other fields of knowledge, which is emphasised by the already mentioned, interdisciplinary character of the spatial research devoted to this branch of national economy.

Final remarks

The current state of Polish geography of construction is a consequence of both the evolution of the scientific discipline itself and the institutional and economic changes taking place in Poland in recent decades. The importance of geography of construction in the general achievements of geographic sciences in Poland in the last decades has undergone significant changes. In the last quarter of the century, a more explicit separation of this sub-discipline occurred, as evidenced by a quite significant number of worthy publications since 1990, undertaking complex themes of construction investments, especially in the context of their functional and spatial diversity.

In quantitative terms, in the second half of the 20th century, a large group of studies were related to industrial construction, including, among others, the issues of conditions and location factors, and its relationship with the development of the industry of building materials. Another important issue analysed in geographic literature at that time was investments in housing, which was probably related to the level of unmet housing needs of the population, especially in large urban centres, during the centrally planned economy.

The last two decades have brought greater thematic diversity of the research issues implemented within geography of construction, conditioned by the changes which after 1990 were brought by the socio-economic processes, progressive globalisation and tertiarisation of the economy, technological development and rapidly changing needs of the society. In addition to the traditionally undertaken issues in geographic studies, the issues of municipal housing and services construction were discussed, rather sporadically referred to in the past. Nonetheless, housing investments are still a significant research topic, whose development and location are analysed in various contexts, often on the border with other scientific disciplines.

Functionally differentiated construction investments remain an important object of research of geographers in Poland. This is evidenced by the rich published scientific output and a number of presentations at conferences devoted to this subject (often seen in its entire interdisciplinary dimension), as well as some successful doctoral dissertations dealing with construction issues in spatial terms. The results of research conducted in this field have contributed in a significant way to better recognition of the conditions and course of socio-economic transformation in Poland in various contexts and various spatial scales.

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Research Issues of the Function of Entrepreneurship in the Socio-Economic Development of Spatial Systems in Polish Economic Geography

Abstract: The issues of economic geography research are subject to constant changes, mainly corresponding to the dynamic changes in the socio-economic space, especially in Polish conditions in the period of systemic transformation. This is also reflected in taking new research directions. One of those developed intensively in Poland after 1989 is entrepreneurship and its role in the development of spatial systems. The theme of the article is, therefore, the research problem of the role of entrepreneurship in the development of spatial systems. In the light of the analysis of the literature on the subject, mainly related to geographic research conducted by Polish researchers in this field, the article analyses various views on the concept of entrepreneurship, determines international and national conditions for entrepreneurship development, and proposes a systematic approach to entrepreneurial function in the development of spatial systems of various scales. The links between entrepreneurship and geography, the significant share of geographers in research in this field and the possibilities of using in this research the model of the functioning of geographical space were pointed out. In the final part, further directions of geographic research on this subject were recommended, which may contribute to the systematic increase of the importance of this discipline in the system of sciences and application activities, in particular in the development, implementation and monitoring of development strategies for spatial systems of different scales.

Keywords: economic geography; entrepreneurship; entrepreneurship education; local development; regional development; research issues in entrepreneurship; socio-economic development

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Introduction

Entrepreneurship is widely regarded as one of the primary factors of socio-economic development of countries and various types of spatial arrangements (regional,

supra-local, local). Particular importance is attributed to it in European countries transforming their economies, i.e. those moving from the centrally controlled economies (often referred to as socialist) and implementing market economy rules. This is due to the fact that in the first half of the 1990s, Poland and other countries of Central and Eastern Europe were in the so-called transformation shock associated with the collapse of many large enterprises and a general reduction in employment, as a result of which unemployment intensified (in the sense of official statistics – it appeared). In the earlier stage of economic development, unemployment was artificially limited, which resulted from an ideological approach to the issue of working in those conditions, based on the assumption of accessibility and a work order for all citizens. A sudden break of this approach in 1989 in Poland generated a surge in unemployment, referred to as structural. The individual entrepreneurship of citizens who set up their small businesses en masse, which was allowed by law liberalised in this regard at the end of 1998, significantly mitigated the effects of structural unemployment in the 1990s and 2000s. Entrepreneurship played a significant role in the decline of unemployment, maintaining the dynamics and accelerating economic growth also in the conditions of economic crisis (2007–2015) and the recovery from the period of recession (second decade of the 21st century). The entrepreneurial spirit of citizens manifests itself not only in establishing their own business, but is also of great importance from the point of view of increasing innovation and competitiveness of enterprises and institutions. Therefore, an increasingly important role in these conditions is attributed to entrepreneurship as one of the key competencies and the factor of socio-economic development. It is manifested in the increasingly frequent considering it in the country's development programs and strategies, as well as local government units. The education system is also increasingly important (Zioło, 2012; Wach, 2013, 2014a, 2016; Rachwał, Kurek, Boguś, 2016; Rachwał, 2017), also in geography lessons (Borowiec, Rachwał, 2011) and geographical studies (Płaziak, Rachwał, 2014a, 2014b).

In the light of the outlined tendencies, the theme of the article is the role of entrepreneurship in the development of spatial systems. Based on the analysis of the literature on the subject, mainly related to geographic research in this area conducted by Polish researchers, it will aim at defining the function of entrepreneurship in the development of spatial arrangements of various scales and proposing further directions of geographic research on this subject. This seems particularly important in the Year of Polish Geography 2018, on the 100th anniversary of the Polish Geographical Society (1918–2018), when Polish geographers attempt to summarise the current achievements and outline new, important from the scientific and application point of view, directions of research.

The concepts of entrepreneurial competencies and entrepreneurship in the light of the subject literature

The importance of entrepreneurial competencies in the modern knowledge-based economy has made them the subject of research and scientific discussion of specialists in various disciplines. The different perspectives of research in the process of exploration of these issues result in both a diversity of defining entrepreneurship, as well as related competencies (Piróg, 2015). D. Piróg (2015) reviews the theoretical studies devoted to the conceptualisation of competencies in the field of entrepreneurship

and attempts to synthesise them to show the evolution of the concept in the last thirty years. The author drew attention to the ambiguity and different understanding of the notion of competency/competencies and entrepreneurial competency/entrepreneurial competencies and the evolution of this understanding from the 1990s when the features related mainly to starting own business were accentuated to the broader understanding that currently prevails. Literature studies prove that competencies that are universally recognised as referring to entrepreneurship are of an extremely eclectic character, which results in conceptual pluralism and a multitude of their classifications (Piróg, 2015). As the author pointed out, in Poland – despite the great interest of scientists in the field of entrepreneurship education – research on conceptualising this concept, and discussion on which competencies should be considered fundamental for a person called entrepreneurial is relatively poor, while the studies that raise the issues of shaping entrepreneurial attitudes of students at various levels of education are dominant (e.g. Rachwał, 2005, 2006; Milewska, 2006; Borowiec, Rachwał, 2011). The characteristics of the entrepreneurial attitude in the studies as mentioned above are primarily based on the competencies held by the entity. For example, T. Rachwał (2005) includes the features that make up the entrepreneurial attitude, among others creativity, proneness to taking the balanced risk, readiness to take on new challenges. Similarly, Strojny (2007) found that the foundation of an entrepreneurial personality is its creativity and ability to solve problems. All components of the entrepreneurial attitude, then called features, today form the canon of entrepreneurial competency (Piróg, 2015). Therefore, the authors agree that entrepreneurship as a competency should be looked at more than only through the prism of willingness and ability to set up own business. This approach is in line with the approach to entrepreneurship as one of the eight key competencies in the European education system (*Key Competencies*..., 2002; *Recommendation*..., 2006; Wach, 2014b; Rachwał, Kurek, Boguś, 2016).

The competency approach is the premise for defining entrepreneurship as a personality trait of a human being. Such an understanding of entrepreneurship is universal, not only for the needs of school and university education but also in scientific research. Most scholars, however, admit that this concept is polysemic (see Brzozowski, 2007) and ambiguous, both in colloquial and scientific language, most often recognised as a feature of human personality and related skills, undertaking own business activity, as well as the ability to take advantage of opportunities in the environment and undertaking creative (innovative) activities (projects). Entrepreneurship as a research area shows exceptional multidisciplinarity, which means that research conducted in many scientific disciplines is separate and interdisciplinary (researching the interface of at least two scientific disciplines (Wach, 2015). As noted by K. Wach (2015) in its essence this phenomenon is difficult to quantify – which is why in economic sciences it is more often discussed as part of management sciences rather than economics. In economy, the most common are simplified models based on the self-employment function (number of newly created companies of natural persons, i.e. sole proprietorships) or the number of entities in the SME sector per the number of inhabitants and their participation in all enterprises. The author points out that "the mainstream economic literature omits entrepreneurship as one of the variables in its models, not to mention the role of entrepreneurship in economic growth or socio-economic development" (Wach, 2015: 25). According to K. Wach (2015), in the economic literature there are four essential functions of entrepreneurship and three derivative functions, which – although quite broadly

described in the subject literature – are not sufficiently distinguished in his opinion, however, they are found in macroeconomic models at the level of enterprise operationalisation. According to K. Wach (2015) essential functions of entrepreneurship in economic sciences include: function of personality, function of managerial actions, function of an individual entrepreneur and function of the market. Three derivative functions of entrepreneurship include: entrepreneurship as an economic production factor, as a function of the SME sector and self-employment in the economy.

Such spheres of understanding entrepreneurship are widely accepted in economic sciences. In geographical research, spatial aspects of entrepreneurship development and its functions in the development of spatial systems are more emphasised. In this approach, the function is understood as an important causative factor, affecting the acceleration of positive changes in the economic structure and acceleration of the rate of economic growth, consistent with previously adopted trajectories of development. Nevertheless, it should be emphasised, after Z. Zioło and T. Rachwał (2012), that the traditional boundaries of research fields between individual scientific disciplines are becoming more and more blurred today. This is particularly visible in the field of geographic and economic research. In economic sciences, space and its diversification are increasingly perceived as the place of new locations.

Similarly, on the basis of geographical sciences, the issue of changes in spatial structures should be increasingly explained in relation to the rules of economic, social and cultural development. The level of space attractiveness plays an essential role in this area as a place for developing entrepreneurship. It affects the level of economic development of various scales of spatial systems and determines their future directions of change. At the same time, the above authors assume that in the market economy, entrepreneurship is becoming an increasingly important feature of the society, which enables shaping a competitive geographical space to dynamise development processes, hence the role of education in entrepreneurship in the socio-economic development of spatial systems of various scales.

Therefore, in research, the concept of entrepreneurship is increasingly used in reference to spatial systems. The concepts of an entrepreneurial city or municipality and region (see Płaziak, Rachwał, 2015) are increasingly widespread in literature on the subject. In this respect, there arises a dilemma whether a spatial unit can be "entrepreneurial" or should entrepreneurship of local/regional government ("entrepreneurial spirit") be discussed. Summarising these considerations, K. Kuciński (2010) assumes that entrepreneurship at the spatial layout (municipal) level in the context of local and regional development has two dimensions:

- entrepreneurship of the local government authorities of the municipality;
- undertaken and conducted business in its area (entrepreneurial attitude of the community and behaviour of companies).

Entrepreneurship issues in geographical research in Poland

Entrepreneurship is therefore of interest to many researchers, representatives of not only management and economic sciences, but also economic geographers. As noted by D. Piróg (2015) in Poland, the increase in scientific interest in entrepreneurial competencies began in the 1990s and mainly resulted from the very process of transformation of the economy. Market economy at that time generated demand for specialists

with skills necessary for active participation in particular stages of transformation, related mainly to the restructuring of industry, emergence of new types of enterprises, development of financial institutions, including banks and stock exchanges, followed by the process of Poland's integration with the European Union and changes resulting from the increasing globalisation. Besides, changes in the national economy management system have resulted in the emergence of new, more favourable opportunities for the development of entrepreneurship. It was favoured by new legal instruments that allowed taking over state-owned business entities through privatisation and the possibility of establishing and developing new enterprises by natural persons. Thus, economic transformations generated a demand for new entrepreneurs and enterprising employees.

A detailed analysis of the issues of entrepreneurship in geographical studies in Poland, based on the extensive literature of the subject, was carried out by Z. Zioło and T. Rachwał (2012). They pointed out that the development of entrepreneurship was of particular interest to researchers in Poland in the years of implementing market economy. It was undertaken on the basis of economic, legal, social and geographical sciences. In individual disciplines, these issues were considered from specific points of view resulting from the subject and research goals of these disciplines. In economic sciences, the attention is mainly paid to the degree of effectiveness of individual business entities; in legal studies, attention is paid to legal instruments for stimulating economic development and conditions for running a business. In the literature on social sciences, the authors focus on the issue of quality of life and professional activity under the influence of developing the economic activity, while in geographical literature the primary focus is on the analysis of spatial diversity and conditions and opportunities for new business entities in the national, regional or local space.

An essential point of interest for economic geographers are spatial patterns of entrepreneurship development, which manifest themselves in the development of individual business activities (e.g. Zioło, Kamińska, 1993, 1996; Zioło, Piróg, 2000; Kamińska, 2006; Kulawiak, 2017; Płaziak, Szymańska, 2017) and socio-economic conditions to undertake and conduct it, resulting from various processes in the world, country and individual regional and local systems. Also, the studies concerned the role of entrepreneurship in raising the competitiveness of society and the economy, as well as shaping the information society (e.g. Zioło, 2006, 2007, 2009a; Gierańczyk, 2009, 2010; Kurek, Rachwał, 2011). A special place is occupied by the issue of the impact of entrepreneurship education on the development of companies, with particular emphasis on family businesses from the SME sector and shaping entrepreneurial attitudes and business competencies of young people in the educational process, including geography lessons. Studies are undertaken to identify the essence of "entrepreneurship" of spatial systems. M. Płaziak and T. Rachwał (2015) in the light of the analysis of the role of entrepreneurship in the national, regional development strategy, outlined the concept of an "entrepreneurial region" pointing to:

- conditions of the entrepreneurial region development (including, among others, macroeconomic conditions, related to the geographical, political and legal location and related to the quality of the education system;
- its more critical components (including the vision of the entrepreneurial region included in the strategy, quality of leadership – management, innovative and competitive enterprises, well-developed network of business environment institutions,

pro-entrepreneurial education system, high-quality human capital with a significant share of the creative class);
– effects of its functioning (including entering the path of sustainable development, change of socio-economic structures, favourable image of the region as an attractive place for investment and residence, improvement of the quality of life of inhabitants, increase of regional cohesion).

It is worth paying attention to the European initiative "European Entrepreneurial Region" (EER), implemented since 2011, on the basis of which three EU regions are selected that have developed outstanding visions for the development of entrepreneurship, regardless of size, wealth, competencies and current level of competitiveness of these regions. Regions with the most convincing and forward-looking studies (proposals) of the strategy for the development of entrepreneurship obtain a special label of the "European Entrepreneurial Region of the Year". In total, in the years 2011–2017, the title was awarded to 21 regions (including one from Poland – Małopolska in 2016). This project contributes to the popularisation of the entrepreneurial concept of the region and scientific research related to it. On the other hand, the participation of many regions in this initiative generates demand for more in-depth research on the role of entrepreneurship in regional development.

Another type of research undertaken on a geographical basis is the analysis of the place of entrepreneurship in strategies for the development of regions and local systems (cities and municipalities). The new paradigm of regional policy implemented in Poland and other European countries takes into account the change in instruments of conducting it, including the increased attention in the instruments of regional policy implementation for the business and its environment. As noted by M. Płaziak and T. Rachwał (2014c), the Polish National Strategy for Regional Development, binding for 2010–2020, lacks a direct reference to entrepreneurship in the formulated challenges and objectives, except detailed directions of measures 1.3.3. *Increasing the possibilities of introducing innovative solutions by enterprises and regional institutions* and 1.3.4. *Supporting the development of business environment institutions (BEI*). Particular attention was paid to the development of entrepreneurship in rural areas, especially those with difficult development, and a relatively large space was devoted to the need to support business environment institutions. Comparing with the analyses (Płaziak, Rachwał, 2014c) of the Finnish and Bulgarian regional development strategies, it should be stated that in the Finnish strategy entrepreneurship is essential: it is treated as one of the foundations for the development of Finnish economy in both national and regional terms. Therefore, the fundamental task of the administration is to support and create the right conditions for business development. This strategy emphasises teaching entrepreneurship at all levels of education, in order to shape an active and creative society, open to entrepreneurial activities. However, in Bulgarian regional development strategy, attention was drawn to the weak development of entrepreneurship in comparison with other EU countries, due to the number of companies, business structure and environment infrastructure as well as public awareness – regional policy in the area of entrepreneurship development is targeted at meeting these deficiencies. In this strategy, the emphasis was put on the development of infrastructure that will support the development of the business. The development of small and medium enterprises as the essential factor of regional development was strongly emphasised. Research studies of this type allow to indicate the possibility of following good practices from other

countries, so they have application values. The effects of this strategy are already visible, as this new approach to entrepreneurship has been included in the Strategy for Responsible Development implemented since 2017 in Poland. However, its provisions and effects require more in-depth research and looking from a particular time perspective, as it is too early for such assessments.

According to Z. Zioło and T. Rachwał (2012), the role of entrepreneurship in the development of spatial systems of different scales results mainly from the following factors and processes:

- an increasingly important role is currently attributed to the entrepreneur who makes specific decisions regarding the location and directions of enterprise development, which, through its relations in spatial systems, influences the development or recession of these spatial systems,
- processes of socio-economic and cultural changes in various spatial systems result from making specific decisions, at the core of which is the entrepreneurship of specific people or teams, including entrepreneurs and representatives of the local and central government.

Thus, entrepreneurship can be treated as one of the essential factors of change contributing to increasing the competitive position of these systems (Zioło, Rachwał, 2012).

In this approach Z. Zioło proposed model approaches to the role of entrepreneurship in economic activation (Zioło, 2007), raising the competitiveness of society and economy (Zioło, 2006) and shaping the information society (Zioło, 2007). It seems that it is an excellent base for conducting empirical research, which will be a partial exemplification of these models, and on the other hand, such approaches allow for synthesising the arrangement of many detailed and often scattered surveys, not only geographical, in this scope.

Conditions for the development of entrepreneurship in spatial systems and the role of geography in its analysis

Analysis of the literature on the subject indicates some conditions for the development of entrepreneurship, of interest to many researchers, including geographers, because many of these factors result from the diversity of geographical space, which is a natural and primary subject of research by representatives of this discipline. These conditions should include (see Zioło, 2005, 2013, 2015; Zioło, Rachwał, 2012):

1. general tendencies of civilisation development, including:
   a) development of information society;
   b) building the knowledge-based economy;
   c) volatility of market systems under the influence of innovative processes;
   d) increased importance of advanced technology products,
2. global (international):
   a) international economic, social and political situation;
   b) affiliation to international groupings (mainly economic and political, e.g. the EU);
   c) economic and political relations between countries, including neighbours;
   d) conditions and possibilities of international flows (products, services, capital, knowledge/technology, population/labour resources);

e) European Union development policies (including regional policy, in relation to the SME sector and others), as well as the quality and effectiveness of EU institutions and instruments;
f) infrastructural development (with supranational functions);

3. internal (national, regional, local):
   a) political and social system, internal political power and stability of the political scene;
   b) quality and level of qualifications of political elites (legislative and executive),
   c) efficiency of administrative structures and relations between society and power (trust level);
   d) size, quality and structure of resources: natural, capital, human (employment);
   e) level and quality of spatial development;
   f) social structures – the intellectual potential of society and the resources of human and social capital;
   g) social climate for stimulating and developing entrepreneurship;
   h) population structures (including age, nationality, education).

There are relationships between particular conditions, which may affect the stimulation and dynamisation of synergistic processes of development or competitive relations may be observed, which may affect the limiting of development processes. Depending on the quality and potential of individual elements of this space, there are more or less favourable conditions for the development of economic activity.

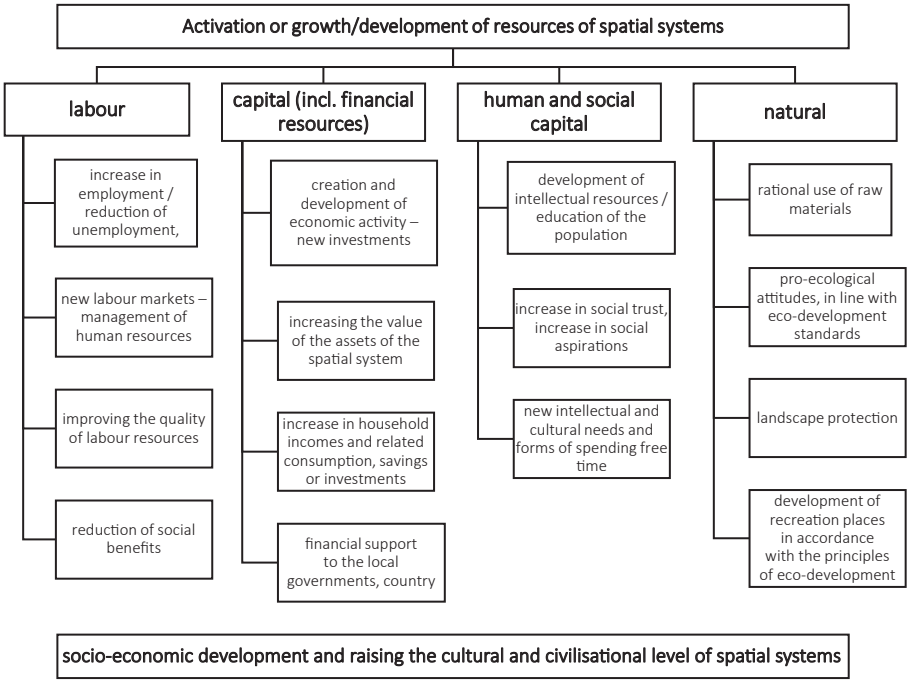
The conditions of entrepreneurship development mentioned above change in specific places of geographical space, because it often creates different conditions for the activation of economic processes. It means that the issue of entrepreneurship development shows close links with research problems and substantive content of geography. Geography, as is widely known, deals with spatial diversity, processes and relations between elements of the natural, economic, social and cultural space. The explanation of these complex relationships may take place in the light of the model of the geographical space, proposed by Z. Zioło (1999, 2009b, 2014). This model allows to adopt, depending on the subject and purpose of the research, the degree of aggregation or disaggregation of elements of the geographical space (consisting of the natural, socio-economic and cultural space). This makes it possible to treat entrepreneurship as an element of the socio-economic and cultural space. By adopting the proposed model in relation to entrepreneurship among the elements of the socio-economic space structure, entrepreneurship could be distinguished, mainly conducted in the form of individual economic activity and smaller entities included in the sector of micro-, small- and medium enterprises, while among the elements of the cultural space structure, among others, the level of education of the population, including education in the field of entrepreneurship, and those elements that make up the cultural aspects of entrepreneurship (such as entrepreneurial attitudes, population aspirations, traditions in the field of economic activity of the population, etc.). Socio-economic and cultural development of spatial systems is fundamentally connected with the entrepreneurial attitudes of the population and the economic potential of enterprises functioning in their area. In a different scale of spatial systems, it is usually done by activating specific categories of resources, assuming a rational and practical use of them.

Entrepreneurial functions in spatial systems – systematisation attempt

Based on the above considerations and literature review, it can be assumed that the functions of entrepreneurship in the development of spatial systems are implemented through its impact on the activation or growth (development) of the following spatial resources: labour, capital (including financial), human and social capital, and natural resources (Fig. 1).

Regarding the labour resources, this contributes, among others, to an increase in employment and reduction in unemployment, expansion of labour markets and improvement of the quality of these resources. Concerning capital, there is an increase in investment and the value of fixed assets of a given system, an increase in income of the population, as well as tax revenues to local government units and the state budget. The impact in the field of human and social capital is reflected in the development of intellectual resources (education level of population), increased social trust and social aspirations. Thus, new intellectual and cultural needs, as well as forms of spending free time, are generated. In the field of natural resources, attention should be paid to the rational use of resources, pro-ecological attitudes, landscape protection and the development of recreation and leisure places in nature following the principles of eco-development. This impact would not have been possible without a significant component of the entrepreneurial attitude, which is ethical conduct, by many authors treated as an

Fig. 1. Entrepreneurial functions in the development of spatial systems



Source: own work

inherent characteristic of an entrepreneurial person (see Rachwał, 2005; *Recommendation...*, 2006; Borowiec, Rachwał, 2011). Nowadays, one should reject the idea of entrepreneurship from the era of the birth of capitalist economies, where the principal and sometimes the only goal of the entrepreneur's activity was to maximise profits without taking into account social responsibility.

It can, therefore, be assumed that thanks to the activation of these four basic categories of resources entrepreneurship helps socio-economic development; it also raises the cultural and civilisational level of spatial systems.

Conclusions and recommendations for further research

Summing up, it should be noted that Polish socio-economic geography has mainly been involved in research on entrepreneurship, but there are some gaps in research interests that representatives of this discipline could develop due to their essential competencies. Such proposals for further directions of geographic research on entrepreneurship include:

- spatial diversification of entrepreneurship indicators in various systems, due to the knowledge of advanced methods of spatial analysis; in this area, of course, the broad inclusion of geoinformation tools is necessary;
- diversification of entrepreneurship of selected sections/branches of the economy (e.g. industry, tourism);
- social determinants (including demographic, related to population structures e.g. education level), economic (national policy, level of technological development and technical and economic infrastructure) and cultural entrepreneurship (including in different countries/regions); in this respect slightly limited involvement of geographers in developing discussions on the entrepreneurship of immigrants or women may be surprising (including culturally different from Poland, e.g Islamic), who have extensive knowledge and research experience in this area;
- entrepreneurial behaviour and attitudes of self-government authorities;
- place of entrepreneurship in regional and local development strategies (it seems worthwhile and promising to develop a universal research pattern);
- relations between entrepreneurship and eco-development in the sustainable entrepreneurship;
- consequences of entrepreneurship development for local systems: social, economic, cultural, and perhaps also natural, in which physical geographers, involved in processes in the natural space, may also be included;
- improvement of research methods and terminological findings (regarding understanding basic concepts and their systematisation);
- the role of education in the field of entrepreneurship in the development of individual businesses and enterprises, and hence the socio-economic development of spatial systems;
- qualifications of geography teachers to teach entrepreneurship, motives for acquiring these qualifications;
- links between education in the field of entrepreneurship with geographical education (in particular economic geography) – identification of cross-curricular correlations;

– objectives, assumed effects, content, education methods in the field of entrepreneurship, especially at lower levels of education (primary school, high school), because representatives of economic sciences are more focused on university education, and economic geographers have participated mainly in the construction of curricula, teaching programs, preparation of educational materials (school textbooks, methodological guides) and teachers of a new school subject, i.e. the basics of entrepreneurship.

The outlined problems point to new research fields and the necessity of its further deepening both in empirical analyses and theoretical approaches. They should be devoted to efforts to develop a concept of adopting rational development goals, making decisions (including in the area of self-government units development) and the possibility of their implementation concerning the rules of economic effectiveness of business entities. Particularly promising should be the considerations regarding various conditions that will constitute a reasonable basis for managing the processes of changes in economic activity in specific places of the diversified geographical space and the impact of entrepreneurship on the development of various elements of the spatial structure.

The above proposals do not, of course, cover the list of possible research themes to be undertaken, but the broader inclusion of geographers in research in this field seems not only possible but necessary from the point of view of a holistic, multi-aspect research into the essence of entrepreneurship and its role in the development of spatial systems.

This new approach in geographical studies on the relationship between entrepreneurship and other elements of geographical space will also allow better integration of geographic sciences, which will contribute to the systematic increase of the importance of this discipline in the system of sciences and application activities, in particular in the development, implementation and monitoring of implementation of development strategies for spatial systems of various scales.

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Contemporary Issues of Services in Light of Polish Geographic Literature

Abstract: Service activity, which is an essential part of modern economy, is constantly changing. The changing economic reality also involves changes in research orientations. Changes in the subject of interest in the literature related to geography of services are a reflection of the changes taking place in services. Economic changes, as well as technological and civilisation progress, result in the emergence of new directions of research, as well as the disappearance of some of the existing ones, which in current circumstances are losing their relevance. The beginnings of geography of services as a distinctive scientific discipline date back to the 1970s. Previously, service research was part of the field of settlement research. The 1970s brought an increased interest in services, which initiated the process of crystallising geography of services, manifested in both theoretical and methodological work. The article discusses current changes in Polish geography of services, in particular its new trends and research directions.

Keywords: geography of services; literature review; Poland

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Introduction

Service activity, which is an essential part of modern economy, is constantly changing. The changing economic reality also involves changes in research orientations. Transformations of economy with technological and civilisation progress result in the emergence of new directions and trends of research, as well as the disappearance of some of the existing ones, which under current conditions cease to be relevant and lose their significance. It is a natural development process of any scientific discipline. "Scientific progress, responding to current questions, leads to civilisation development, and this in turn opens new research fields through the emergence of new research needs" (Retkiewicz, 2014a: 157). Similar trends are observed in the area of geography of services. It

is connected with the basic role of geography, which according to Z. Chojnicki (1991: 371–372) is to "more faithfully and deeply describe and understand the world, and thus obtain a more interesting and useful knowledge".

The beginnings of independent systematic research on geography of services as a distinctive scientific discipline date back to the 1970s (Werwicki, 1998; Kłosowski, 2006a; 2006b; Ilnicki, 2014). In the past, research on services was mainly conducted within the field of settlement research. Only the l970s brought increased interest in geography of services, and its crystallisation into a separate discipline, manifested in publishing both theoretical and methodological papers (Polarczyk, 1970, 1971, 1976a, 1976b; 1979, Nowosielska, 1994). Since then, there has been a continuous increase in the number of research papers related to services. D. Ilnicki (2014) notes, however, that Polish literature on the subject lacks comprehensive, synthetic studies that capture the problems of the sector and the entire sphere of services. Nowadays, studies on services are fragmentary, both in relation to the composition of services and the scale of analysis (Ilnicki, 2014). This brings, among others, a lack of visual progress on the basis of theory, practice and methodology of geography of services. The reasons for this state of affairs is believed to be primarily in the heterogeneity of services and conditions related to the lack of interest by stakeholders positioned in economy and politics (Jakubowicz, 1993; Nowosielska, 1994; Ilnicki, 2014).

In the development of Polish research on services, D. Ilnicki (2009) proposes the delimitation of four periods: (1) the beginning of research on services – until the early 1970s, (2) systematic service surveys (1970s and 1980s), (3) the first decade of the transformation period (1990s), and (4) contemporary geography of services (from the turn of the century). A comprehensive chronological and thematic approach to services in Polish literature on the subject was presented by D. Ilnicki (2009, 2014). The aim of this article is to try to discuss the contemporary changes in Polish geography of services, in particular the characteristics of new trends and research directions, attempt to answer the question in which direction it is developing and what its challenges and possible scenarios for further development are. The time range of this analysis is the last period of development of Polish geography of services, which dates back to the beginning of the 2000s.

Characteristics of contemporary research trends in Polish geography of services

As mentioned in the introduction, service activity, which is an essential part of modern economy, is subject to constant changes, which is reflected in the achievements of geography of services. The transformations taking place in the sphere of services can be considered through structural and restructuring changes. A similar division can be applied to the main contemporary research trends. In structural terms, the achievements of contemporary Polish geography of services include, among others: (1) increased interest in modern services based on knowledge; (2) undiminished dominance of studies in the field of broadly understood commercial services, (3) relatively weaker achievements in the field of public services. In addition to structural changes in the sphere of services, there are also organisational changes, which are also reflected in the achievements of modern geography of services. Among them, the most important are: (1) outsourcing of services resulting from the increase in competitiveness linked to

the globalisation process; (2) the process of internationalisation of services as a result of progressive globalisation (the phenomenon of offshoring); (3) changes in terms of forms of distribution and the provision of services, and contact with the customer as a result of technological progress, in particular the development of the ICT sector. In the further part of the study, an attempt was made to organise the achievements of contemporary Polish geography of services in reference to the presented transformations in the sphere of services.

One of the basic features of the achievements of Polish geography of service is its fragmentary and an increasing number of detailed studies related to the narrow scope of certain types of services. The increase in interest in modern knowledge-based services (knowledge-intensive) is particularly visible. According to theories of service activity, knowledge-intensive services are gaining importance in the structure of modern economy. Their development was caused, inter alia, by increased competitiveness and the related increase in the demand for specialised and modern services using advanced technologies, both within the enterprise and acquired. They play an important role at every stage of the development of innovative economy (from generation of innovation, through its transfer to economic practice, support of the commercialisation process, to sales) and thus are becoming its indispensable element. The growing importance of this type of services in the economy is also reflected in the number of studies on this subject. Among the works in this field, one can list studies on the diversification of the level of development of services based on knowledge (Knowledge Intensive Services – KIS), or their part related to business support (Knowledge Intensive Business Services – KIBS), and the role they play in dynamising the processes of economy based on knowledge (KBE) in various spatial scales: in the EU countries (Skórska 2012, 2015; Węgrzyn, 2013; Zięba, 2015; Wyszkowsa-Kuna, 2016), and in regional terms (Skórska, 2016; Dominiak, 2017a). In this context, in the subject literature, there is also the concept of new and modern services (largely identified with more or less services based on knowledge). In Polish literature, the term new services was used, among others, in the following studies: E. Jakubowicz (2000), M. Sobczyński, A. Słowik (2000), A. Janc (2001), D. Ilnicki (2001; 2003; 2009), J. Dominiak (2017a). New services include dynamically developing services with high knowledge saturation, related to IT support, scientific, research and development, financial, insurance and broadly understood consulting services (organisational, economic, technical, marketing, etc.) (Dominiak, 2017a, 2017b). These services have developed in Poland only after the systemic changes of 1989, and their importance in the development of innovative and competitive economy is constantly growing, which is reflected in the increase in interest in this type of services in publications. The achievements related to spatial diversification of the development of specific types of knowledge-intensive services are dominated by the studies related to: (1) ICT services (e.g. Męczyński, 2006; Micek, 2006, 2008; Stryjakiewicz, 2009; Strożek, Jewczak, 2016), (2) financial services (e.g. Ilnicki, 2003; 2006; 2007; 2008; Weltrowska, 2003; 2007; Brezdeń, Spallek, 2009), and (3) services for producers and business (e.g. Dominiak, 2006, 2008a, 2008b, 2012b, 2013, 2018; Dzieciuchowicz, 2009a, 2009b, 2009c, 2009d, 2009e, 2009f).

In addition to the dynamic increase in the number of studies related to knowledge-based services, the continuation of a large interest in traditional services, including primarily commercial ones, can be noted in the output of modern geography of services. Geography of trade, dealing with the study of trade in space, including most of

all the links between the distribution of enterprises and commercial establishments versus consumer behaviour, is one of the basic areas of geography of services (Dzieciuchowicz, 2012a). According to J. Dzieciuchowicz (2012a), traditionally the most important research topics of geography of trade include: (1) analysis of market areas of outlets and service centres; (2) determinants and models of spatial behaviour of store customers; (3) spatial and institutional organisation of trade; (4) internationalisation of wholesale and retail trade; and (5) impact of technological progress on the development and distribution of trade. The evolution of the problems of geography of trade in Poland is presented in the studies of, among others, D. Ilnicki (2009), S. Ciok and D. Ilnicki (2011), and J. Dzieciuchowicz (2012a). They draw attention to the emerging new directions related to the creation, evolution, location of new shopping centres in urban space and urban agglomeration as multifunctional outlets combining commercial, gastronomic, cultural and recreational functions (Kaczmarek, Kaczmarek, 2006; Kaczmarek, 2014; Więcław-Michniewska, 2006) and retail chains (Wilk, 2005, 2012, 2013). J. Dzieciuchowicz (2012a) writes about new geography of trade that begun in the 1990s in which most attention is paid to contemporary changes in trade in the socio-economic space. Among the key research problems dealt with by new geography of trade J. Dzieciuchowicz (2012a) lists the following: concentration and restructuring of trade in space, trade supply networks, areas of trade exclusion, geography of international trade and geography of virtual trade.

Public services are much less popular in geographical surveys. In this area, we find studies primarily related to geography of education, devoted to higher education, focusing on academic centres and analysing their impact on the development of cities and regions (e.g. Gaczek, 2006; Wolaniuk, 2006, 2008; Bajerski, 2008; Wiśniewski, 2008; Ilnicki, 2008).

In addition to structural changes in the sphere of services, there are organisational changes too, which are also reflected in the achievements of modern geography of services. An important role in these changes in services is played by the globalisation process. Between the two megatrends – the process of service development (servicisation) and the globalisation process, there are bilateral relationships that dynamise both processes (Naisbitt, 1997; Masłowski, 2008). On the one hand, globalisation stimulates the demand for new services, on the other – the rapid development of services, especially the ICT sector, favours the processes of globalisation. The ongoing globalisation along with the increase in competitiveness is the direct cause of significant organisational changes in service activities. These include: the process of internationalisation of services, externalisation of service provision and the use of outsourcing in order to minimise the operating costs of enterprises. Many studies related to the service sector are devoted to the issues of changes in the processes of organisation of service activities in the era of globalisation. First of all, they mainly concern the outsourcing and offshoring processes. Relocation of services following globalisation is the subject of studies of, for instance, A. Zorska (2007, 2008) and B. Liberska (2008). The increase of interest in the literature of subject in the centres of shared services, which provide services (usually IT, accounting, etc.) to the units of a given international corporation worldwide, is particularly noticeable. Poland sees its chance of development as a country with well-educated staff and at the same time competitive labour costs. These centres are most often located in Asia, but also in Central and Eastern European countries, including Poland (Nowocień, 2007; Mielcarek, 2008; Dominiak, 2012a). These changes would not be

possible without the use of modern technologies, which are essentially responsible for changes in the sphere of services. Particular importance is attributed to the development of information and telecommunication technologies. Thanks to the Internet, the geographical space permeates with cyberspace (Ilnicki, 2006; Retkiewicz, 2008). The development of the Internet, according to many, not only did not translate into a crisis in geography, but initiated geography of the Internet (Castells, 2003, 2007). The Internet is only seemingly non-location-based and non-spatial (Ilnicki, Janc, 2008; Ilnicki, 2014). In this context, it is worth paying attention to the impact of the Internet and the entire ICT sector on service activity. It caused the transfer of some services to cyberspace and the development of new forms of service provision, distribution and forms of contact with the client. It is responsible for an important aspect of organisational changes in the sphere of services, consisting in the development of new forms of providing traditional services with the use of computer techniques and the Internet (electronic services). Electronic services treated as a new form of providing traditional services or completely new services constitute an important branch of modern geography of services. It is the development of electronic services (e.g. electronic administration, distance education or e-commerce) that revolutionised the sphere of services at the beginning of the 21st century. In this area, there are papers analysing changes taking place in traditional service activities, e.g. in administration, trade, education, banking, and even medicine due to the use of various types of devices (especially computer devices) and the Internet. Numerous studies are devoted to the functioning of electronic administration, e.g. M. Kaczmarek-Śliwińska (2004), I. Jaros (2005), W. Michalski (2006), R. Perdał (2008; 2011), A. Minkowski, P. Motek, R. Perdał (2009), J. Drobiazgiewicz (2010), T. Taraszkiewicz (2010), and electronic banking – e.g. M. Szcześ, S. Jakubiec (2002), M. Polasik (2007), J. Weltrowska (2008, 2009). Dynamically developing electronic commerce is also gaining more interest, e.g. B. Księżopolski, Z. Kotulski (2004).

In addition to the research trends mentioned above, geography of services is also concerned with issues related to the differences in the level of development of the services sector, structural changes in the services sector, servicisation and the role that services play in the socio-economic development at various spatial scales (national, regional, and local). These issues are the themes of studies of, among others, S.M. Szukalski (2004), J. Dominiak (2004), K. Kłosiński (2006), M. Wodnicka (2009), G. Węgrzyn (2009), I. Rudawska (2009), I. Lichniak (2010). At the same time, it should be pointed out that among the studies in the field of geography of services, the static over dynamic approach is definitely predominant (Ilnicki, 2014), which is related to the changes taking place in the classifications of economic activity. The change of Polish classification of economic activity PKD 2004 to PKD 2007 (forced by changes of the NACE of the EU), led to the lack of comparability and difficulty in conducting analysis of the structural changes of the services sector and dynamic outlines in the time series covering the period before 2009.

Perspectives and challenges for the development of geography of services

Further development and evolution of geography of services will probably be associated with future changes in the sphere of services. One of the most important challenges seems to be the process of servicisation understood not only as the increase in the

importance of the third sector (tertiarisation process), but also – and perhaps above all – the process of increasing the importance of service functions, also in the production activity. The growing importance of services in production processes and the links between the production and service sectors leads to the interpenetration of both of these activities (Wyszkowska-Kuna, 2016). According to the theory of Giarini, services cease to be an economic sector, and they are becoming functions that have dominated many production activities at every stage. The intensification of the penetration of material and service products has led to an increased blurring of boundaries between the sphere of services and the sphere of production (the concept of the extended product of Levitt). More and more often we are dealing with an extended product created as a result of continuous enrichment of the offered product with the so-called accompanying services, which over time become an integral part of the product. Production companies do not sell only material goods anymore, but instead offer packages with individualised design, service, etc. There is no unambiguous boundary between companies producing goods and providing services. Many service companies operate on the principle of production companies, and as a result of their activities a standardised, mass service is created. Services have begun to be "produced" like material goods. There is even talk of a process of industrialisation of services[1] (Szukalski, 2009). On the other hand, production companies are transformed into services due to commissioning the production process itself to subcontractors, while they specialise in design, marketing (e.g. Apple). It is becoming increasingly difficult to clearly assign a company to the sector. Work in production companies is not limited to pure production activities, but more and more employees are involved in service activities such as management, design, finance, marketing. In this context, it seems important to use a functional approach in the analyses of the differences in the level of service development and their types, taking into account the entire sphere of service activity, including the one implemented in the production sectors.

The integrated approach should also cover various scientific fields dealing with issues related to the sphere of services. Increasingly attention is paid to the "appropriation" of the subject of services by technical sciences, especially those related to the ICT sector (Rogoziński, Gnusowski, 2017). It seems, however, that it can be perceived not only in the context of a threat, but also an opportunity offered by such integration. It gives the opportunity to use modern techniques in analyses related to the distribution of service facilities, access to services, or research on the extent of their impact.

It also seems that the trend connected with the development of research on modern knowledge-based services, and in particular their relation to the development of modern economy, will continue. Networking of the economy, the importance of which is emphasised in the context of increasing the level of innovativeness of economies, will result in an increase in the demand for various analyses of links between the sphere of services related to the innovation environment (universities, R&D sector, institutions responsible for innovation transfer) and business entities implementing innovations.

Summary

An overview of Polish studies devoted to service activities allows us to formulate the following features of its achievements. In structural terms, one can notice, inter alia, an

[1] "The industrialization of services is understood as providing services that take on a massive, standardised character based on the industrial technology of their provision" (Szukalski, 2009: 51).

increase in interest in modern services based on knowledge; dominance of studies in the field of broadly understood commercial services and a relatively smaller achievements in the field of public services. Trends in services are directly or indirectly related to technological progress, hence they are often referred to in terms of service innovation. It is particularly true of organisational changes (the phenomena of outsourcing and offshoring) and changes in the distribution of services and contact with the client (electronic services), which are the result of the progress in the field of modern information and communication technologies. The main directions of changes in research trends in Polish geography of services in the analysed period are and will be associated with processes occurring in the socio-economic reality.

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Industry and its Surroundings – Multiplier Effects and Embeddedness of Companies

Abstract: Research of industrial enterprises concerning their impact on the surroundings through multiplier effects is becoming more and more important due to changes in the organisation of production processes. They mainly result from the increasing technological advancement of products and the need to achieve the expected financial effect, which is possible only through large-scale production. The result of these components is a continuous increase in the specialisation of both companies and individual industrial plants. These processes are reflected in contemporary models of industrialisation, which show that companies operate on the basis of more and more complex value-added chains. This increases the indirect impact of enterprises on the development of the surroundings. The article aims to present the mechanism of functioning of multiplier effects and indicate factors that affect different sizes, as well as the scale of their range. It also presents the evolution of the idea of multiplier effects on the ground of macroeconomics and shows the contribution of Polish researchers to this trend of knowledge. It should be noted that the research to date in this area is not often undertaken both on scientific grounds and in the field of broadly understood economic consulting for the benefit of local government units, which results mainly from the lack of data. The need to obtain detailed data, particularly financial data, within the company chain is a crucial barrier.

Keywords: embeddedness; industry; multiplier effects

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Introduction

Economic effects that are a derivative of the development of existing industrial plants or the location of new production entities are much more significant than the direct effects of these investments. This results from the indirect impact of enterprises on the socio-economic environment. It is particularly important in the case of industrial activity operating on the basis of the lean manufacturing model, which assumes conducting

industrial production through an extensive network of cooperative relations. In such a business model, a substantial part of the effects of the company's impact on its surroundings is indirect.

Therefore, the most significant effects of the impact of new industrial enterprises on the surroundings are, from the point of view of the development of cities and regions, the creation of local and regional networks of business connections. This process is called the cooperation effect because it usually causes the location of cooperating companies in the vicinity of the recipient's factory. In this way, the production plant, creating networks of connections, causes the so-called multiplier effects on the local economy. They are the result of an increase in income in the economic balance of the place where new economic activity has been developed. It results from the cash flow from the producer both to the network of subcontractors (as a result of the supply of products or services) and to the local market through the remuneration of employees.

An essential element may also be the formation of a positive image of the region, in the case of the location of essential enterprises from the point of view of, for example, the labour market or product brand awareness. The increased recognition of the region resulting from the success of recognised corporations leads to the effect of imitation, causing the emergence of new investors. Subsequent investors together with their co-operators, locating their activities in a given area, may trigger feedback the so-called snowball effect consisting of a rapid increase in the attractiveness of a given location for new investments. In this way, places of particular attractiveness for investments develop. A. Markusen (1999) called them 'sticky places' (Dicken, Malmberg, 2001; Cantwell, 2005), while in Polish terminology the term 'viscosity of places for capital functions' is used (Domański, Gwosdz, Sobala-Gwosdz, 2009). As a result, some places can concentrate significant capital expenditures.

As the indirect impact of enterprises on the surroundings is very wide, the present article focuses on the issue of companies' impact on the surroundings resulting from the increase in capital flow in the economy due to new investments, as well as factors embedding companies in local economic structures that translate into different levels of the spatial closure of finance flows.

Multiplier effects – theoretical approach

Establishment or development of economic activities in a given area results in an increase in income in the economic balance of a given place. Increased revenues, in turn, translate into an increase in the number of jobs in other enterprises and institutions. The effect of this is an increase in the wealth of societies, the economy, as well as – through increasing tax revenues – of territorial units (municipalities, cities, regions or countries). This increase is referred to as multiplier effects, and their size allows to assess the impact of the company's activities on the functioning of companies in its surroundings.

By definition, the multiplier effect is understood as a phenomenon consisting in the development of economic activities resulting from an increase in demand, both from consumers and companies (supply) resulting from the location of a new or extension of an already existing enterprise. These effects may also take the negative form in the opposite case – the reduction or liquidation of the previously existing activity.

The multiplier effect as a concept in the field of macroeconomics appeared already in the 1930s (Keynes, 1936). John M. Keynes (1936) noted that the increase in investments by business entities causes a general increase in the level of global demand. Higher demand, on the other hand, results in increased employment, production and employee incomes. Consistently with this process, consumer spending on produced goods increases, causing an increase in sales of enterprises, which, as a result, will again increase their production, which further affects the growth of the necessary amount of labour force and production factors. The very concept of a multiplier, therefore, results from the mathematical procedure of multiplying the size of an investment by a given multiplier to obtain the value of the total impact of a new investment on the economy. The investment multiplier (mi) is, therefore, a coefficient determining how much income (Y) will increase in a state of equilibrium as a result of a new investment (I).

Keynes (1936) considered the phenomenon of multiplier effects on the national scale. Therefore, the sum of the multiplier effect has been reduced to the increase in national income. When calculating the multiplier itself, the critical factor is the share of consumption in public spending. As there are only two possibilities of disposing of income, consumption or savings, part of the additional income that has not been consumed is a saved part. Part of the incremental income that has been saved is called marginal propensity to save (MPS).

In the presented theory, Keynes argued that the higher marginal propensity to consume (MPC), the higher the multiplier effect. It is because the society spends more money, which stimulates the economy, whereas if the savings increase, they do not participate in circulation, which reduces the multiplier effect. The marginal tendency to save affects the magnitude of the multiplier effects inversely.

We can express the investment multiplier formula according to Keynes' concept (1936) by the following equation (Fig. 1):

Fig. 1. Multiplier formula according to Keynes' concept

$$mi = 1/MPS$$

or

$$mi = 1/1 - MPC$$

where:
MPS – marginal prosperity to save,
MPC – marginal prosperity to consume.

Source: J.M. Keynes (1936).

In contrast, the multiplier effect formula has the form (Fig. 2):

Fig. 2. The multiplier effect formula

$$\Delta Y = \Delta I\ (1/MPS)$$

where:
ΔY – national income growth,
ΔI – investment growth,
MPS – marginal prosperity to save.
Source: Keynes (1936)

It should be borne in mind that the average propensity to save (APS) increases with increasing income. Therefore, the increase in income does not translate linearly into a linear increase in multiplier effects.

Since the first model of Keynes (1936), the conceptualisation of multiplier effects based on econometric models has been widely developed. The most important studies in the methodology and estimation of multiplier effects on examples of various regions include, among others: W. Lee Hansen and Ch.M. Tiebout (1963), K. Sasaki (1963), S.J. Weiss and E. Gooding (1968), P. Bourque (1969), C.S. Yan (1969), D.H. Garnick (1970), N.J. Glickman (1971), E.M. Hoover (1971), P. Lloyd and P. Dicken (1972), J.M. Mattila (1973), O.P. Hall and J.A. Licari (1974) and R.L. Drake (1976). Centres of regional econometric analyses have been established, primarily in the United States, such as the Bureau of Economic Analysis and Economic Modeling Specialists, which deal with the estimation of economic effects resulting from multiplier effects not only due to new industrial investments but also as a result of the development of other economic activities. They are based on input-output models, used for the first time in regional analyses by W. Leontief (1936), providing a framework for the predictive model of the multiplier used in these studies.

In studies of the above literature on the subject, we usually encounter three unique types of multiplier effects, indicating the degree of impact of specific types of enterprises in the surroundings. These are the following effects:

- direct,
- indirect,
- induced.

Direct effects are those changes in the local economy to be investigated which are known or anticipated. Indirect effects, on the other hand, constitute economic operations resulting from satisfying the outcomes of direct effects. Induced effects come from local expenditure on goods and services from people working to satisfy both direct and indirect effects. Therefore, the total impact of a given investment is the sum of all the effects – direct, indirect and induced. The results of calculations of multiplier effects can be presented both in the form of calculations of generated additional incomes – income multipliers, as well as jobs – employment multipliers (Hayter, 1997). In both cases, the value of the multiplier received is multiplied by the generated income or jobs in a given activity, and the product is the value of the total income or jobs obtained in the studied region.

In Polish geographic literature, several studies have been recently produced that are derived from the models by K. Gwosdz and K. Wiedermann (2005) in the development of a study edited by B. Domański and K. Gwosdz (2005) on the impact of the Mielec SEZ on its socio-economic environment. Other studies include works on the automotive industry of Śląskie Voivodeship and its impact on the surroundings (Wiedermann, 2006, 2007, 2008; Rachwał, Wiedermann, 2008), and a publication edited by W. Jarczewski and M. Huculak (2011) on Niepołomice, in which studies of multiplier effects of industrial companies were developed by K. Gwosdz (2011). Other examples include the study edited by T. Stryjakiewicz (2004) on the influence of foreign investors on the surroundings based on the example of GlaxoSmithKline.

In the above-mentioned studies, the model of the most commonly considered type of multiplier effects consists of supply and income effects. The additional demand generated by new companies allows the growth of enterprises that are suppliers of goods

and services. As a result, multiplier supply effects are created. In turn, income effects result from the increase in the purchasing power of the population through the remuneration of employees. Companies that satisfy consumer needs gain from it. Additional demand for products and services caused by the development of some companies means that other enterprises are also developing. Further on, these enterprises are starting to create more demand. It triggers successive cycles of multiplier effects. The model of multiplier effects based on supply and income effects is presented in a study on the impact of the enterprises of the Mielec SEZ on the surrounding (Domański, Gwosdz, Huculak, Wiedermann, 2005). Its more mathematical version referring to the n^{th} order of multiplier effects is presented in K. Wiedermann's monograph (2016).

In the case of comparisons of many studies of multiplier effects, especially from the United States, one can see some similarities between indirect multiplier effects and supply effects. In both cases, the effects resulting from the supply generated by the production plants are most often considered. In turn, income effects are included in the analyses as induced effects. The development of companies also positively affects the income of the budget of the state, gminas and poviats. Taxes paid on the income of natural and legal persons, property tax and the tax on means of transport allow the creation of new investments, which are financed from the central budget and are conducted by various local government units.

The size of individual types of multiplier effects is also strongly diversified in the socio-economic space. It is due to the diversity of business connections with their local and regional surroundings. While the effects of income multiplier are mainly concentrated in the local surroundings, the supply relations in the vast majority go beyond this area. This process is nowadays becoming more and more critical as the level of networking of production processes increases. The strength of the company's connections with the external environment is called its embeddedness.

The range of multiplier effects and the embeddedness of industrial production

From the point of view of the relationship between industry and the local environment, the spatial distribution of multiplier effects, and precisely their size and degree of closure within a given centre, is of highest importance. The combined effects include both the development of local enterprises and suppliers located in other areas. The more materials and services are purchased in a given city or region, the more complete are the local or regional multiplier effects. The size of local multiplier effects also depends on the type of business and the size and characteristics of the company. Individual types of activities and companies also differ in the spatial extent of multiplier effects, including the degree of their local closure. Local supply effects are usually stronger in the case of companies that operate longer in a given place and are based on domestic capital, including, in particular, those that have their head offices in a given location (Wiedermann, 2016). However, for foreign companies, they are usually weaker (Domański, 2001).

The degree of closure of effects in the local space of cities or regions results from the degree of embeddedness of manufacturing companies in the surroundings. Thus, local embeddedness expresses the strength of the company's connections with the immediate surroundings. Common globalisation processes and the development of

transport systems lead to a growing spatial range of links in industry. It often results in limiting the supply possibilities provided by local producers that manufacture semi-finished products destined for further processing in final production plants. At the same time, factories producing parts and components look for suppliers in increasingly distant locations, where production is cheaper, which results from lower production costs, and hence the greater competitiveness of companies operating primarily in the developing countries of Central and East Asia. The effect of this process is the decreasing importance of final producers in creating local and regional production multiplier effects (Dicken, Forsgreen, Malmberg, 1994).

Investigations on the strength of connections of new investors, constituting sizeable foreign manufacturing enterprises with their surroundings in the countries of Central and Eastern Europe, have been undertaken many times. The analyses showed that the embeddedness of such enterprises is usually small. This phenomenon is expressed in the metaphor of the cathedral on the desert (G. Grabher, 1994), which describes a small impact on the broader economic development of poorly embedded new industrial investments in the local and regional environment of Eastern Germany. Also, some investments in Poland take the nature of an isolated enclave, which has no connection to the local or national environment (Hardy, 1998). The complexity of foreign investors' relations with the local surrounding, including service links and impacts through staff and its revenues, has been shown in more extensive studies (Sobala-Gwosdz, 2000; Domański, 2001, 2004; Stryjakiewicz, 2004; Domański, Gwosdz, 2005, 2009; Wiedermann, 2006).

Small and medium-sized enterprises show a much higher degree of embeddedness concerning branches of transnational production corporations through stronger local and regional production and service links, as well as broader use of local human and capital resources, especially in the area of higher value-added work (Gwosdz, 2014). Research carried out by M. Dej (2011) prove that positive social and economic effects resulting from embeddedness of companies are particularly strong in the case of native local enterprises whose owners come from their place of business or live in its vicinity. The size and spatial distribution of multiplier effects are significant. These effects make up the development of local enterprises and suppliers located in other areas. The more significant the number of materials and services purchased by companies in their immediate environment, the higher the local closure of multiplier effects.

The size of the multiplier effects depends on the type of business and the size and attributes of the company. Selected industries and enterprises differ in the spatial extent of multiplier effects, which is, among other things, the degree of their local closure. Regional supply effects are usually stronger at a time when the situation concerns companies that operate longer in a given place, such as enterprises with family capital having their head offices in a given location. For foreign companies, especially in the case of greenfield investments focused on global sales markets, they are usually weaker (Domański, 2001; Domański, Gwosdz, 2008, 2010; Wiedermann, 2006). Multiplier effects in the business environment, created by commissioning service tasks, are usually stronger than the effects resulting from the product supply. Of course, the most local nature refers to the remuneration multiplier effects, which is related to the location of the place of residence of the employees. The size of these effects is influenced primarily by the number of jobs offered and the level of employees' remuneration.

The social and economic characteristics of a given area have a significant impact on the size of local multiplier effects. Capture of multiplier effects by a given city and agglomeration is in no small extent the result of the ability of local enterprises to meet the demand reported by production companies. It depends on the size, development indicator and elements that make up the local economy, as well as the involvement of local business entities and, in some cases, public authorities. According to K. Pawłowski (2007), the role of small and medium-sized enterprises (SME) in the economic development of the region is more important than the investments of large foreign enterprises. However, it should be borne in mind that the investments of international corporations, with sufficiently strong embeddedness and features of the local society, may become locomotives of local economic development, which enable a more extensive growth of SME entities in the surroundings of these plants.

An essential element affecting the higher degree of closure of multiplier effects in a given city or region is the degree of isolation of the studied area from other economic centres, which by definition may be competitive. Referring to microeconomics, we can conclude that this is due to the marginal propensity of companies to import, which is negatively correlated with the distance from the competitive centre (Shanidsaless, Gillis, Shaffer, 1983).

The model approach to the relationship between an industrial enterprise and its surroundings in the context of embeddedness was presented by K. Wiedermann (2016). According to the author, the two most important variables affecting the embeddedness of companies, are the type of products manufactured and the place of origin of investment capital. In the case of production assortment, the degree of firm embeddedness differs primarily between the production of standard (traditional) products and custom-fit products, which usually show greater innovation and design. In the case of the place of origin of capital, the scale of business links is primarily affected by the fact whether the enterprise is the result of investments of endogenous or exogenous origin.

For enterprises producing standardised products in the case of an investment by an external company, it is noted that in the investment region there is often only a production plant and suppliers of essential services (security, cleaning, operating canteens) who are located there primarily due to the short time of their implementation. Higher-order services are subordinated to the company's parent unit. In such cases, practically all decision-making competencies are located in the head office where the given investment is subjected. A separate group are suppliers of parts and subassemblies whose products go directly to the plant. Their location is often found in low-cost countries, which allows low-cost sourcing. Such an organisation model is a typical example of the so-called cathedral in the desert distinguished by G. Grabher (1993) and J. Hardy (1998).

In the case of a local company, the network of cooperative links looks a bit different. a large part of units, including the management, as well as design and implementation centre, is located in the region of the company's investment. Outside, there are suppliers of standard final product components, whose production is most profitable in countries with lower manufacturing costs. This element is similar for both types of investors.

In the activities of enterprises producing customised products, an increase in the importance of local component suppliers is noticeable. It is particularly evident in the case of investment by an external company, which is often based on a local supplier

park. As in the case of standard products, the plant is located outside the central office, where jobs essential from the point of view of building a post-industrial society are located, i.e. those related to product design and research and implementation activities, as well as sales support and contracting departments. The difference is the emergence of direct access to limited higher-order services performed locally, which is the result of obtaining certain decision-making powers, as well as much broader connections with suppliers of components in the region of investment. In the case of a local company investment, there are greater similarities between the production of standard products and the so-called custom-fit products.

Method for calculating multiplier effects

Multiplier effects arising in the local environment of large enterprises and economic zones are not often addressed by researchers. It is due to the need to use an analysis method other than that used for the country or region. Data on inter-branch flows at local and supralocal levels are unavailable. Therefore, attempts are made to use the questionnaire method.

Estimating the size of multiplier effects on a local scale carries a lot of methodological problems, primarily in the spatial dimension. The empirical studies of local and regional multiplier effects conducted so far in the national system were based on the results of research carried out in the Mielec Special Economic Zone (Domański, Gwosdz, Huculak, Wiedermann, 2005), Niepołomice (Jarczewski, Huculak, 2011), business services centres and passenger transport companies in Krakow, as well as in the car industry companies in the Śląskie Voivodeship (Wiedermann, 2006). In the case of multiplier effects expressed in the number of jobs, small differences in their total numbers were observed. It is due to a small variation in income effects depending on the industry. However, in the case of supply effects, this variation is more significant. These differences occur among dominant sectors depending on the business activities studied. The primary spatial difficulties in estimating multiplier effects include the issue of determining the boundary of the local environment, estimating the scale of local leakage of multiplier effects outside the city or region, diversification of the multiplier effects depending on the geographical scale, as well as differences between the place of paying taxes and the actual place of residence.

The scale and size of multiplier effects are always determined for a specific time interval. If the development of individual enterprises occurs between the two-time sections determining a given unit, so that they generate additional consumer or supply-demand, multiplier effects are beneficial for a given economy, as they create new jobs in a given area. However, in the opposite case, when there is a regression of the company's activity or its development, which causes a reduction in additional external demand, which occurs, for example, during the modernisation of production processes resulting in a decrease in labour demand (increase in work automation), the multiplier effects are negative. To calculate the number of jobs created due to the functioning of industrial enterprises through the process of multiplier effects, it is necessary to set a period for which these effects will be calculated. Due to the necessity of including the dynamics of the phenomenon, the analysis of the scale of multiplier effects often assumes a period between the creation of a given investment and the state for which research is conducted. In this case, the current state is referred to as the base level, which equals zero.

In the adopted method, the size of multiplier effects is expressed by the number of persons employed outside newly created investments whose work results from the functioning of these companies. The basis for calculating the multiplier effects is information obtained through surveys and interviews conducted with a representative group of industrial enterprises and in business entities that are their co-operators. Part of the information on operating costs, average wages or the household expenditure basket is available from official statistics (CSO) and financial statements of enterprises (Monitor Polski B). In the case of discrepancies in data from several sources, lower values should be used, which means that the calculated employment may be slightly underestimated rather than overestimated. Thanks to this, it can be determined what the minimum number of jobs has been created thanks to the new investments.

Supply multiplier effects

The supply multiplier effects include the supply of raw materials and production materials (supply production multiplier effects) and the provision of services to the enterprise (supply service multiplier effects). Due to the different relations of industrial enterprises located at various levels of supply chains, the production supply effects are very diverse. In the case of the location of factories producing final products for the consumer market, the level of supply multiplier effects is vast in the network production model. The establishment of such a factory raises the necessity of building a network of numerous cooperating companies, which also show the demand for deliveries for the needs of manufactured parts and subassemblies. Therefore, the higher the level in the production chain (value added), the higher are the indirect effects of the factory's impact on the surroundings. The type of production is also vital for the scale of supply effects. Manufacturing products with a higher degree of complexity results in the creation of a much larger supply network. The level of technological advancement of products plays an essential role in this respect. The higher the specialisation and the technological complexity of production, the faster and on a larger scale a cooperating factory needs to specialise in a given production, which follows the concept of cross-linking.

In the area of supply multiplier effects, a group of services should be distinguished, which can be potentially used by enterprises for outsourcing. In the era of cross-linking economic activity and the concentration of companies' attention on significant production, external services have been subject to sub-contracting processes even earlier and to a much greater extent. In their case, transaction costs determine the formation of separate business entities to an even greater extent. Among the outsourced services, the following types can be distinguished – basic and specialised services. The first of these groups are primarily:

- transport,
- cleaning and maintenance,
- security,
- occasional and permanent catering service;

while the second group includes:

- making tools and servicing devices,
- design and research services,
- legal services,
- financial services,

– IT services,
– employee training services.

The essential differences between these services depend on the degree of their specialisation, which results in a different scale, but also the range of multiplier effects of the services provided. In the first case, these are services with lower added value, which do not require high qualifications of employees, so local companies can provide them. In the case of highly specialised services, the effects are more significant due to the higher unit cost of transactions, but also the network of connections can take on a global character, most often not connected with a local plant, but with the company's head office. Previous studies on the development of multiplier effects were based on surveys and interviews that allowed determining the shape of the network of connections. Next, based on the input-output models and supply value data, the scale of multiplier effects was determined.

To determine the number of people working in the following levels of the supply chain based on the data on the money flow, the following models for calculating the multiplier effects were used (Wiedermann, 2006, 2016), allowing to estimate the number of newly created jobs at suppliers. To calculate them it is necessary to obtain information on the income of enterprises, the share of supply in income and costs related to employment (Fig. 3–6).

In order to determine the size and range of impact of a particular type of investment on the environment during interviews in a representative group of companies, information on the use of the above types of services in the place of origin of contractors and the number of people who are involved in work for individual companies should be obtained. On the basis of interviews conducted in this way, as well as interviews with co-operators operating in particular industries in accordance with the developed algorithm presented on the above diagram (Fig. 3–4), the size of employment generated by suppliers can be estimated. In this case, it is necessary to obtain the data on income of the enterprises, the share of supply in income and costs related to employment.

Fig. 3. The developed algorithm

$$Msup = Rni \times Ssc$$

where:
Msup – amount of money for suppliers
Rni – revenue of the new investment
Ssc – share of supply costs

Source: Wiedermann (2016)

Fig. 4. The developed algorithm

$$Jsup = Msup \times Sec / Sucw$$

where:
Jsup – new jobs at suppliers
Msup – the amount of money for suppliers
Sec – share of employment costs in revenues
Sucw – unit cost of the workplace

Source: Wiedermann (2016)

To calculate the next order of supply multiplier effects, the algorithm presented in Fig. 4 was used. It allows calculating jobs. If the data on the revenues of individual companies or entire groups of enterprises is missing, it is necessary to calculate them. In this case, the calculation can be made from the number of jobs existing in given companies or industries as well as labour cost structures in the income and cost of one job for a given type of activity (Fig. 5).

Fig. 5. The developed algorithm

$$Ient = Jno \times Sucw / Sec$$

where:
Ient – income of the enterprise
Jno – number of new jobs
Sucw – unit cost of the workplace
Sec – share of employment costs

Source: Wiedermann (2016)

After calculating the number of jobs generated in the supply of enterprises in subsequent orders of multiplier effects, the results obtained should be summed up. The resultant value is the total number of jobs created thanks to the supply demand generated by new investments.

INCOME MULTIPLIER EFFECTS

In addition to the delivery of goods and the use of services, the companies influence the surroundings by acquiring employees. Their income increases the purchasing power of the community, which leads to the development of enterprises that meet the consumption needs of employees and their families. Multiplier income effects are the result of the increase in the purchasing power of the population through the remuneration of employees, which leads to the development of companies that meet consumer needs. The more people have a job as a result of the creation of new activities or the development of existing ones, and the more people earn, the higher are the income multiplier effects resulting from consumer demand. For this study, algorithms were constructed (Fig. 6–8) to determine the number of new jobs created as a result of new investments. If, as a result of the new investment, jobs are created, then multiplying them by net wages will give the sum of money allocated by a given group of employees for consumption purposes. The multiplication obtained in this way is multiplied by the share of individual industries in the expenditure basket, which is published by the Central Statistical Office, as a result of which we receive the income of money for individual industries. After multiplying this value by the share of labour costs for a given industry, then after dividing it by the cost of the workplace, we get the number of newly created jobs in a given type of activity. The total number of jobs for all industries gives the total number of jobs created thanks to the consumer demand of employees of the analysed industrial enterprises. Another order of multiplier effects is consumer demand generated by employees of enterprises in particular industries in which new jobs have been created. For these jobs, we calculate the next order of multiplier effects according to the same procedure (Fig. 6).

Fig. 6. The developed algorithm

$$Mecon = Jno \times Mwor$$

where:
Mecon – amount of money flowing into a given economy
Jno – number of new jobs
Mwor – net salary

Source: Wiedermann (2016)

It should be remembered at this point, as already mentioned earlier in this chapter, that the salary level has a positive effect on the amount of money spent on consumption, but this relationship is not linear. The higher the income of employees, the higher the propensity to save, which translates into a decrease in the share of money spent on consumption. Therefore, to account for this differentiation, it is necessary to recalculate the income earned by employees in line with the expenditure basket. In the case of Polish statistics, the CSO publishes reports on the proportions of savings and expenses, as well as diversification in the expenditure basket itself. Therefore, to determine the amounts flowing from the employees of companies to particular sectors of the economy, it should be – as the above equation shows (Fig. 6) – multiplied by the participation of a specific sector in the employees' expenditure basket (Fig. 7).

Fig. 7. The developed algorithm

$$Mind = Mecon \times Seb$$

where:
Mind – amount of money reaching particular industries
Mecon – amount of money flowing into a given economy
Seb – share in the expenditure basket

Source: Wiedermann (2016)

So to calculate the number of jobs created as a result of the development or location of new industrial investment, the previously calculated amount for a specific industry (Fig. 7) should be treated as an additional income and multiplied by the share of labour costs in the industry's revenues. In this way, we will get information about the money allocated to labour costs, which after dividing by the unit labour cost for a given industry will give us the final result in the form of newly created jobs (Fig. 8).

Fig. 8. The developed algorithm

$$Jind = Mind \times Sec / Sucwi$$

where:
Jind – new jobs in the industry
Mind – amount of money reaching particular industries
Msup – amount of money for suppliers
Secb – share of employment costs in industry revenues
Sucwi – a unit cost of the industry's workplace

Source: Wiedermann (2016)

It should also be remembered that due to consumer demand, trade and service companies produce, apart from jobs, the need to supply products and services related to their business. It generates more jobs in wholesale of food and industrial goods, as well as in manufacturing companies due to supply demand.

RESULTS OF RESEARCH ON THE SCALE OF MULTIPLIER EFFECTS IN POLAND IN THE LIGHT OF WORLD RESEARCH

The results of research carried out in Poland on the size and range of multiplier effects indicate the relatively small scale. The highest values of indicators were obtained in the research conducted by K. Gwosdz (2011) and implemented as part of the project of the Institute of Urban Development on Success of pro-investment policy of the town of Niepołomice (Jarczewski, Huculak, 2011). The results in the calculation of multiplier effects indicated that for every 100 employees in companies operating in the Niepołomice Investment Zone (NIZ) there were 68 additional jobs on country scale. In the case of regional closure (Małopolskie Voivodeship), the scale of multiplier effects was calculated at 46 additional jobs for every 100 jobs in the NSI. If we translate this data into multipliers, it would be 1.46 for the regional and 1.68 for the national multiplier, respectively (Gwosdz, 2011). Slightly lower values of indicators were obtained during previous research on the impact of the Special Economic Zone Europark Mielec on its surroundings (Domański, Gwosdz, Huculak, Wiedermann, 2005). In the study prepared for the Agency of Industrial Development (Domański, Gwosdz, 2005), the calculated value of the multiplier was 1.55 in the case of closure of effects on the national scale. On a regional scale, this value was 1.43, while on the local level it was 1.38. An even lower level of indicators was obtained during regional studies on the automotive industry in the Śląskie Voivodeship (Wiedermann, 2006). In this case, the estimated number of jobs generated by the automotive industry in its environment in the Śląskie Voivodeship was at least 13,000. These were mainly jobs resulting from the demand of automotive companies for services and the resulting from the consumer demand of employees of automotive companies. Subsequently, the demand for the supply of products for further processing in automotive companies and workplaces created in successive multiplier order effects was significant.

The results of calculations of multiplier effects obtained in the above research projects deviate significantly from the data obtained during research in the most developed countries (Gwosdz, 2011). A study by G. Weisbrod and B. Weisbrod (1997) conducted in large cities in the United States indicated that the multiplier values for industrial activities were in most cases in the range of 1.5 to 2 depending on the type of production. Even higher values of the multiplier were reported by the studies of D. Mulkey and A. Hodges (2003), who indicated that these values ranged from 1.5 to 2.5. Therefore, lower levels of obtained results testify to a lesser degree of cross-linking of industrial production on a local and regional scale in Poland as compared to the economies of more developed countries (e.g. the United States). That is why, to a greater extent, these effects "leak" beyond the borders of the country.

The low value of the obtained results may also be thought-provoking from the perspective of information provided during the announcements of new industrial investments. In such cases, most often when justifying public aid for new companies, information is given on the size of the multiplier of up to 5 or 7 people working in the

surroundings per each new job created in the factory being opened. These values are therefore fundamentally divergent in comparison to those in the studies carried out.

Especially the case of the low value of the multiplier for the automotive industry is puzzling, because this type of activity shows very high cross-linking indicators, especially on a regional scale. The large size of connections results mainly from the specificity of production, that is, on the one hand, from the complexity of the final product, which is a car, and on the other from the multiplicity of production departments whose products are parts and components of the final product. An essential element is also the scale of the companies' operations and the complicated logistics of production deliveries for specific orders, causing the need to expand the numerous partners near the company. Thus, a dissonance arises between the expected and obtained multiplier value indicating a much lower scale of multiplier effects.

The low value of the indicators results from the failure to take into account the supply multiplier effects among companies in the following levels of the supply chain located in the research area. The multiplier effect calculated for the impact of companies on the surroundings does not take into account the respective multiplier effects between the cooperating entities. The result of such a balance is the lack of jobs created at the supplier as a result of supplying the parent company. We could, therefore, speak of a considerably larger scale of multiplier effects in the case of considering only the plants of the final producers. It would turn out that the majority of these effects on the automotive industry fall on the Fiat and GM Opel factories operating here. Thus, the total balance could be reduced to the fact that 7,000 jobs in car manufacturing plants have created 33,500 jobs at supplier companies and an additional 13,000 jobs through multiplier effects calculated for the entire automotive production system. In this case, the sum of jobs of 7,000 resulting from the operation of Fiat and GM Opel would give 48,500 jobs in the environment, which would apply to the multiplier value at 6.93. Of course, manufacturers of parts and subassemblies do not work exclusively for the needs of factories located in this region, so it is impossible to attribute all supplier jobs to the supply multiplier effects of these two companies producing cars. However, this simulation indicates that much higher multiplier effects relate to the functioning of companies producing ready-made products for the sales market than in the case of industrial co-operators producing factory supply elements.

Conclusions

As shown in the article, the development of the local economy resulting from the initial impulse, which is the location of the production plant, resulting in the emergence of new companies in its environment, both through the effects of cooperation and imitation, helps to improve the situation on the labour market and stimulates the commercial and residential real estate market. All these elements lead to an increase in revenues of both companies and population, translating into an increase in revenues of local governments from taxes, thanks to which territorial units on which production activity develops, become more prosperous.

For urban and regional development, greater attention should be paid to the scale of companies' impact on their surroundings. This aspect should be taken into account when considering supporting measures for enterprises, especially in the case of newly created business entities. Existing regulations place more emphasis on the direct

impact of companies on the labour market, as well as on the scale of investment outlays, where production equipment of enterprises is the highest expenditure.

In the actions taken in the field of pro-investment policy, those investments should be more supported, whose supply chains will be as much as possible demonstrated by the local and regional closure of supplies. From this perspective, the critical factor is the investor's local origin. It is also critical in the case of the development of products based to a greater extent on the production of technologies that have a more significant impact on the creation of post-industrial communities. Therefore, much more significant development effects are possible to obtain as a result of the development of technology parks combined with business incubators allowing for the extraction of companies based on endogenous resources.

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Changing Geographical Patterns of Automotive Industry in Poland

Abstract: The paper aims at identifying the main trends in the spatial patterns of automotive industry in Poland and their underlying changes. The analysis includes the distribution of employment in the sector by regions (voivodeships) in 1998 and 2015 on the basis of the Central Statistical Office data, as well as the location of greenfield plants built in the country since 1991 using the authors' database. It is shown that after the general stability of the spatial pattern of production in the first transformation phase of the 1990s, a major shift towards south-western and western Poland together with the decline of the historically dominant region of Warsaw took place later. This can be explained by the success and/or decline of some leading producers and trends in the location of new plants dependent on the proximity to foreign markets, good road accessibility and industrial traditions (labour skills) in the main. These tendencies are in congruence with the general changes in the spatial pattern of Polish industry as a whole, with the growing role of Wielkopolskie and Dolnośląskie voivodeships and the decreasing share of Mazowieckie in the national industrial employment. The rapid expansion of automotive industry in Upper Silesian Industrial District has contributed to its successful restructuring.

Keywords: automotive industry; geographical pattern; Poland; spatial changes

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Introduction

Post-socialist transformation brought about fundamental changes in Central European manufacturing. State ownership was replaced by private enterprises and Eastern European markets largely by the Western European ones, which was accompanied by the reshaping of organisation, technology, productivity and employment. The dynamics and attributes of these processes differed among various sectors leading to significant changes in the sectoral structure of manufacturing. The interesting question is to what

extent these radical restructuring resulted in a shift in geographical distribution of production and employment.

The issue of the geographical change of industrial activity can be approached in the evolutionary theoretical perspective. On the one hand, the privileged position of the developed regions based on agglomeration economies could be expected. Among other advantages, they might benefit from the established market position and supplier networks of large firms, as well as possible spinoffs. Moreover, foreign investors, which have become important forces of the growth of Central European economies since 1989, often tend to locate in the advanced areas of emerging countries, the capital region in particular, rather than in peripheral regions, due to easier availability of information and lower uncertainty (Dicken, 2015). On the other hand, the development of old industrial districts may be hindered by negative mechanisms of lock-in, as a result of overspecialisation, oligopolistic economic structures and/or institutional sclerosis and rigidification (Hudson, 1989; Grabher, 1993; Hassink, 2010). Their situation may be exacerbated by their negative image of areas of unfavourable environmental and social conditions, including strong unions and high wages. In addition, institutional approach may be useful here to capture the role of public authorities in the processes of regional change.

The authors address the problem of changing spatial patterns of automotive industry in Poland. The aim is to identify the main trends in this respect and the factors underlying the regional and local changes.

The automotive sector seems particularly suitable to address these questions due to its fast expansion in Poland and in Central Europe in general in the last two decades, as well as vast domination of foreign-owned companies (Domański, Guzik, Gwosdz, Dej, 2013). It is a prominent sector of high-volume production including both sophisticated components and relatively simple labour-intensive ones. The share of the automotive industry (NACE 29) in the total sold production of Polish manufacturing and mining has increased from 2.4% in 1991 to 10.7% in 2016 (6.7% in value added and 6.2% in employment of national industry). The broadly defined sector provides about 20 per cent of Poland's exports and contributes to an increasing trade surplus in manufactured goods with core economies of Western Europe.

The development of the automotive sector or passenger car industry in Poland from the spatial perspective has been analysed earlier by K. Gwosdz and G. Micek (2010), P. Lizak (2011) and P. Nowak (2011). There are several studies on the geographical change in other manufacturing sectors in Poland, most of them illustrate moderate changes in spatial structures, e.g. in fish processing industry (Czapliński, 2013), furniture production (Dyba, 2017) and brewing industry (Wojtyra, Grudzień, 2017), but some reveal more radical shift, e.g. in footwear manufacturing (Kocaj, 2016). This can be seen in a broader context of changing patterns of the transition of Polish economy (Stryjakiewicz, 2009), foreign investment in the country (Tobolska, 2014), the impact of changing spatial accessibility (Komornicki, Rosik, Śleszyński, Solon, Wiśniewski, Stępniak, Czapiewski, Goliszek, 2013) and the multiplier effects of the supplier networks of large firms (e.g. Wiedermann, 2006; Stryjakiewicz, 2008).

The paper is divided into four main sections. First, the distribution of employment in automotive industry by regions (voivodeships) in 1998 and 2015 is examined with shift-share analysis on the basis of the Central Statistical Office data on the narrowly defined automotive industry (NACE 29). Then the analysis of the location of greenfield

plants built in the country since 1991 is carried out using the authors' database covering broadly understood automotive sector, including NACE 29 together with the producers of auto components classified in other branches, especially seats, electric, plastic and rubber parts. This is followed by the explanation of the identified trends and conclusions with comparison to trends in other countries and Polish manufacturing in general.

Regional differentiation of the sector 1998–2015

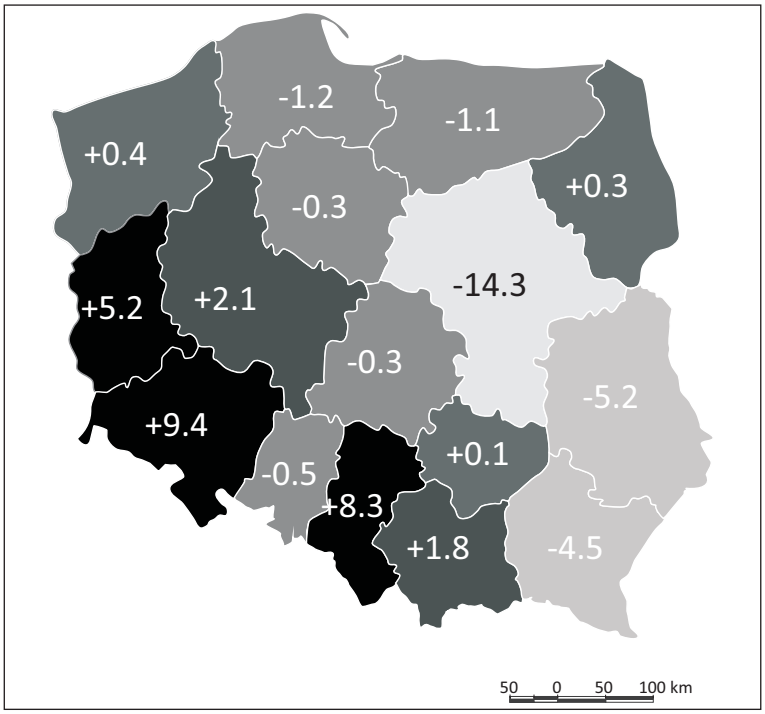
When state socialism ended there were two major concentrations of the automotive industry in the country: in the capital region of Warsaw in central Poland and in the Upper Silesian Industrial District with Bielsko-Biała area in the south. The former represented the historical core of the sector, which began with assembly activities before World War II and grew following the establishment of FSO in 1950 with numerous branch plants and component suppliers in the region. The latter was largely a product of the creation of FSM in 1971 with an engine factory in Bielsko-Biała, the car assembly plant in Tychy and about a dozen branch plants. There were also two truck plants (Starachowice and Lublin) and a bus factory (Sanok) in the south-east of the country, as well as smaller ones in western Poland (Jelcz, Nysa, and Poznań), but they were not accompanied by a large number of suppliers.

Fiat was the first international carmaker that decided to invest in Poland acquiring FSM in 1992. It was followed by Daewoo Motors, which bought the Warsaw-based FSO and Lublin light truck plant in 1996, while VW started to expand a small light vehicle factory in Poznań in 1993. In 1998 a new greenfield car assembly plant was opened by General Motors in Gliwice in Upper Silesia. Truck and bus factories were chiefly privatised by domestic capital, new bus assembly plants were located by Volvo in Wroclaw and MAN near Poznań. Major foreign supplier companies, including Delphi and Valeo, gradually increased their investment in the country taking over state-owned producers and/or building new factories (Domański, 2001).

Despite considerable ownership shift, the geographical picture of the automotive industry in the late 1990s was more or less the same as a decade earlier. More than 40% of employment in the sector in 1998 was concentrated in two regions: Śląskie (22.4%) and Mazowieckie (18.1%), and nearly two-thirds in four voivodeships including Podkarpackie (11.7%) and Wielkopolskie (10.7%). The decline of the Starachowice truck plant resulted in the lower position of Świętokrzyskie.

The rapid growth of production, fuelled primarily by vast foreign investment, led to a systematic increase in the number of people working in the automotive industry in Poland since 1998. By 2015 the employment in the narrowly defined automotive sector (NACE 29) has risen from 100,600 to 177,100 people. In absolute terms, the largest growth in employment took place in Śląskie (+31,800), followed by Dolnośląskie (+22,700), Wielkopolskie (+11,900) and Lubuskie (+9,700). The shift-share analysis confirms the enhanced role of south-western regions of Dolnośląskie (+9.4 percentage points) and Śląskie (+8.3) along with western voivodeships of Lubuskie and Wielkopolskie, and partly Małopolskie. On the other hand, a spectacular decline occurred in the share of the central region of Mazowieckie (-14.3 percentage points), and to somewhat lesser extent in the case of Lubelskie and Podkarpackie in the south-east (Fig. 1).

Fig. 1. Shift-share in the employment in automotive industry (NACE 29) in Poland, 1998–2015 (changes in the share of voivodeships in the national employment in the automotive industry)

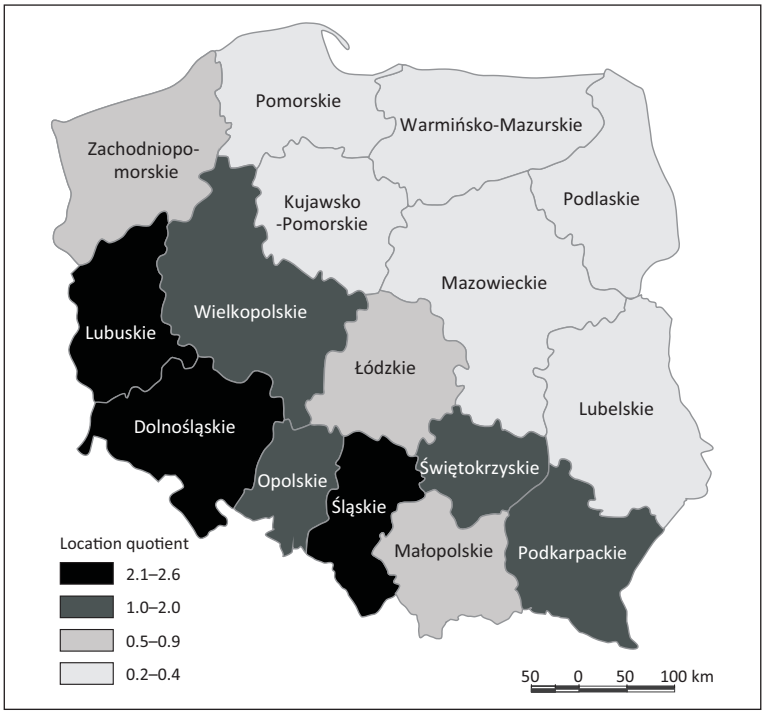


Source: authors' work based on the Central Statistical Office data

Mazowieckie and Lubelskie have experienced an absolute loss of employment, whereas the number of jobs in Podkarpackie has increased, but at a lower rate than nationally.

Thus, the spatial distribution of the automotive industry in 2015 differs significantly from the situation in the first decade of post-socialist transformation. There is a strong agglomeration of the sector in south-western Poland with the new core in Śląskie voivodeship, including Upper Silesian conurbation, Bielsko-Biała subregion and Częstochowa. Its share in the national employment has increased to 30.7%, and the share of Dolnośląskie to 17.3%, hence these two voivodeships concentrate almost half of the workforce of the Polish automotive industry. Wielkopolskie represents 12.8% of the employment in NACE 29. Five voivodeships of south-western and western Poland together with Lubuskie and Opolskie comprise 70% of this employment. The marked specialisation of these regions in the automotive industry is illustrated by the location quotient comparing the share of employment in NACE 29 sector and the share of working age population. Such location quotient is the highest in Śląskie, Dolnośląskie and Lubuskie, and above average in Wielkopolskie, Opolskie and Podkarpackie (Fig. 2). Despite the relatively slower growth since 1998, Podkarpackie shows the fourth largest workforce in the sector (7.2%), and three south-eastern voivodeships including Małopolskie and Świętokrzyskie represent 16% of the national employment. Lubelskie is no longer important here, and the share of Mazowieckie is merely 3.8% now.

Fig. 2. Location quotient of the employment in automotive industry (NACE 29) in relation to the working age population in Poland in 2015



Source: authors' work based on the Central Statistical Office data

Location of greenfield plants since 1991

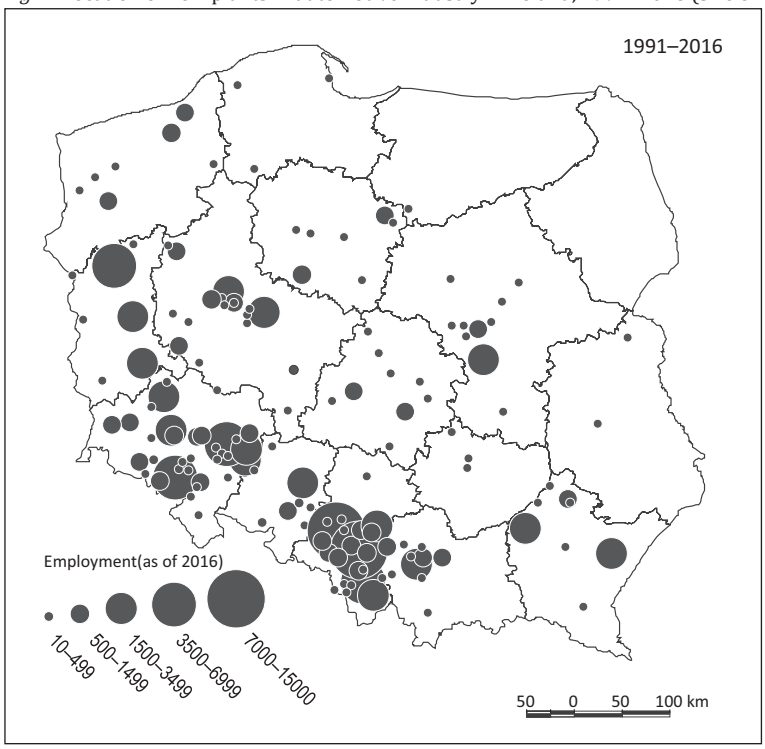
What deserves special attention from the geographical point of view is the location of new plants. There are 325 greenfield factories manufacturing motor vehicles and their components that opened in Poland between 1991 and 2016. Fig. 3 shows that their spatial distribution is extremely uneven (Fig. 3).

By far the largest concentration of new automotive plants is found in Śląskie – in the historical Upper Silesian Industrial District and the Bielsko-Biała area to the south. Substantial greenfield investment in the sector has been attracted by Dolnośląskie, where it is located both in the Wrocław metropolitan area as well as in Legnica-Polkowice subregion to the west and the Sudeten to the south. Large and medium-sized factories have also been built in Wielkopolskie, Lubuskie and Opolskie.

Greenfield investment outside south-western and western regions have been relatively rare. Some of it has taken place in Małopolskie and Podkarpackie in the south-east as well as in Mazowieckie and Łódzkie in central Poland, but very few in other areas of eastern and northern parts of the country.

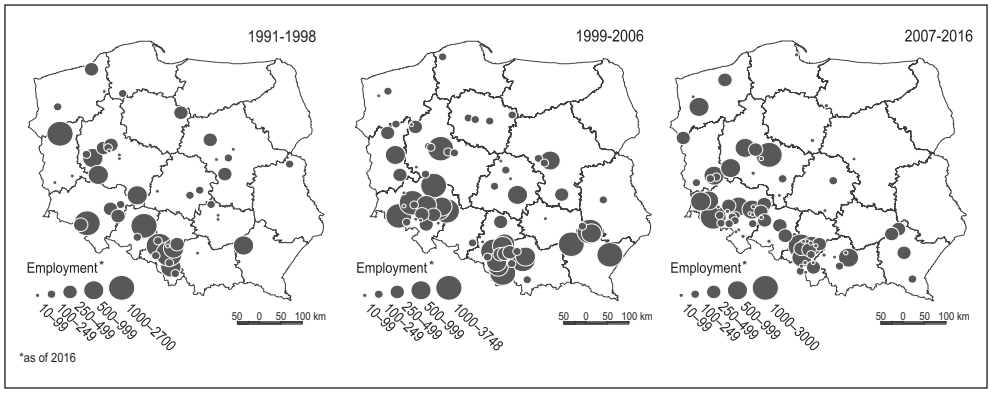
It is interesting to examine the location of greenfield plants opened in three periods: 1991–1998, 1999–2006 and 2007–2016, i.e. after the financial crises (Fig. 4). South-western and western regions have been attractive places for the location of new factories from the early years of the transformation until nowadays. This is also to a lesser extent true about Podkarpackie in the south-east. Greenfield investment in Małopolskie started at

Fig. 3. Location of new plants in automotive industry in Poland, 1991–2016 (size of employment in 2016)



Source: authors' work

Fig. 4. Location of new plants in automotive industry in Poland, 1991–1998, 1999–2006 and 2007–2016 (size of employment in 2016)



Source: authors' work

the end of the 1990s. By contrast, automotive plants were built in the central regions of Mazowieckie and Łódzkie in the 1990s and at the beginning of the 21st century, but this is no longer the case in the recent decade. The trend to locate factories in south-western and western parts of Poland has never been so dominant as since 2007, when almost no companies chose central and eastern Poland, except for Podkarpackie.

Factors affecting the geographical shift in Polish automotive sector

After little change in the spatial pattern of the automotive industry in Poland in the 1990s, a major geographical shift took place in the 21st century. It stems, on the one hand, from the successful development or decline/closure of some large existing producers and, on the other, from the trends in the location of new plants.

The early privatization of FSM and the modernisation and expansion of car and engine production by Fiat together with the advent of its Italian suppliers strengthened the position of the Upper Silesian and Bielsko-Biała region. This increased its attractiveness for the greenfield investment of various component producers[1], which was further boosted by the location of a new General Motors assembly plant, and is discussed in detail later. A similar process to some extent took place in Wielkopolskie with a gradual development of van production by Volkswagen in Poznań.

At the same time, Daewoo Motors, which had become the owner of FSO, ran into financial trouble after the Asian crisis in the late 1990s, went bankrupt and was sold to GM, but its overseas subsidiaries were not part of the deal. FSO became controlled by the Ukrainian carmaker UkrAVTO and finally stopped car assembly in 2011. As a consequence, the manufacturing of automotive components in the Warsaw region has also significantly decreased and some of the suppliers shifted to other production.

In addition, the collapse of Daewoo resulted in the bankruptcy of the van producer in Lublin in 2001. Moreover, Zasada Group was not able to maintain the position of truck and bus manufacturers in south-eastern Poland; hence the role of this region in the sector has been diminished. The Starachowice factory was taken over by MAN in 1999 and specialises in the production of bus frames now[2], the Sanok plant is again state-controlled after its bankruptcy in 2013.

The large number of new factories built in Poland since 1991 had a vital impact on the contemporary geographical picture of the industry. Three fundamental factors seem to have determined their location: the position in relation to the market (customers), geographical road accessibility and the availability of skilled labour.

The automotive industry is characterised by the extensive network of suppliers and deliveries are increasingly made on a just-in-time basis, i.e. they arrive at the assembly plant shortly before they are needed in order to reduce the costs of inventory. To facilitate the reliability of such deliveries the majority of suppliers are located within a one-day driving distance from their customers, which means up to 700–800 km (Klier, Rubenstein, 2010). In the situation when automotive components made in Poland are primarily exported to Western Europe, Germany, Italy and France in the first place, eastern and northern regions of the country are at a disadvantage. Furthermore, the dynamic development of the automotive industry in Poland is part of its growth in the broader Central European agglomeration. Numerous plants located and expanded in south-western Poland are suppliers of factories situated nearby in the Czech Republic, newly-built assembly plants in Slovakia, as well as automotive producers in Hungary.

[1] Determinants and effects of the development of automotive industry in Śląskie voivodeships were examined by Wiedermann (2006)

[2] In 2016 MAN relocated production of city buses from Sady near Poznań and coaches from Salzgitter to Starachowice, increasing employment.

A favourable location in relation to customers as well as various suppliers is connected with good geographical accessibility of a factory. As most transportation goes by road this means a privileged position of areas with modern motorways. There is little doubt that the early construction of the A4 motorway as the first motorway in the country, linking Lower and Upper Silesia with Germany and further with the European road network, was instrumental in attracting numerous new factories in these regions. Its eastern extension made Podkarpackie voivodeship the only region of eastern Poland with significant greenfield investment. The A2 motorway is important for the location of new plants in Wielkopolskie and Lubuskie, while the motorway A1 improved the connections of Śląskie with the Czech Republic, Slovakia and Italy.

Quality requirements in the automotive sector are particularly high. It is evident that most greenfield investment was located in towns and regions with industrial history, where technical culture and skilled manufacturing labour could be found. This is true of south-western and western regions, but also Podkarpackie due to the traditions of the Central Industrial District dating back to the 1930s.

The role of the public sector and policies is interesting in this context. There are two mechanisms how it could affect the location of new factories. First, the establishment of early special economic zones in the 1990s, when only limited areas offered tax exemptions and infrastructural advantages, was important in the case of Upper Silesia, Podkarpackie and partly Lower Silesia. Second, the pro-investment attitude and activity of local authorities mattered. This could have a self-reinforcing effect due to the learning process in the communes which were successful in attracting an investor and developed their competences in meeting the expectations of further firms.

Last but not least, there is clear imitation behaviour in locational choices of foreign investors. This is illustrated by the fact that there are more than ten or even twenty automotive plants of various firms situated in a single town, e.g. Gliwice, Bielsko-Biała, Wałbrzych, most of which are not connected by direct supply linkages. The choice of a place where other manufacturers have invested earlier may depend on serving the same customer, but may also stem from favourable infrastructural conditions created by the local authorities and lower uncertainty related to the presence of other firms. In addition, companies often choose location of a new factory in the same region where they already have production facilities, e.g. Toyota, Faurecia, Tenneco, which is associated with their knowledge about the area and allows better management and possibly workforce transfer.

All things considered, western and especially south-western Polish regions offer the best conditions for the location of new automotive plants: proximity to the major foreign markets, good accessibility and skilled labour. Their attractiveness for the component manufacturers has been enhanced by the location of the GM car assembly plant in Gliwice, new bus factories of Volvo in Wrocław and Solaris and MAN near Poznań, as well as the expansion of existing car plants in Tychy and Poznań. The immense greenfield investment has not been discouraged by the traditions of strong trade unions and environmental problems characteristic of old industrial regions such as Upper Silesia and the Sudeten. Together with the development of existing plants this contributed to their current dominant position in the automotive sector of the country, even though two important final producers from the socialist era lost their significance – the Nysa van plant went bankrupt and the state-owned Jelcz company remains a small-scale manufacturer of military trucks.

The loss of the leading role in the discussed industry by the Warsaw region is an effect of the collapse of the foreign investor which controlled the core company. What is harder to explain is the limited greenfield investment in Mazowieckie, and in central Poland in general. This may be related to a relatively late motorway connection, high costs of land in the fast growing metropolitan area of the capital city (Gwosdz, Micek, 2010), possibly insufficient supply and high costs of industrial labour force and lower maximum regional aid intensity than in other regions. The development of the sector in Łódzkie was similar to the national trend. One of few large domestic-owned automotive manufacturers is situated here – Wielton established in Wieluń in 1996 has become one of the top European producers of semi-trailers and trailers.

Świętokrzyskie has retained its position, despite lower employment in the Starachowice factory and very little greenfield investment. In contrast, several large and medium-sized new plants were located in Podkarpackie due to its industrial labour supply, good connection through the A4 motorway and possibly higher regional aid intensity than in western regions, but the region has suffered from the difficulties of the Sanok bus factory.

It has to be emphasized that if we take into account a broadly defined automotive sector, including components classified outside NACE 29, the picture of the industry in some regions may be different. There are for example a tyre plant in Dębica and a factory of rubber components in Sanok in Podkarpackie, another large tyre producer is situated in Olsztyn in Warmińsko-Mazurskie in the north-east and several manufacturers of plastic parts are located in Kujawsko-Pomorskie and Łódzkie.

There is some evidence of the functional division between metropolitan areas and higher developed regions of Upper and Lower Silesia and Wielkopolskie on the one hand and eastern Poland including Podkarpackie on the other. More sophisticated higher-value added products seem to be manufactured in the former, while the latter tend to specialise in more simple, labour-intensive ones. The issue is worth broader analysis and discussion as the specialisation in various types of products may affect the future prospects of individual industrial towns and regions.

Conclusion

The time of the dynamic growth of Polish automotive industry is a period of a major shift in the spatial distribution of production, which began in the late 1990s. The radical change in the geography of the sector results from both massive foreign greenfield investment in south-western and western regions and the collapse of some companies – foreign investors such as Daewoo and former state-owned monopolistic manufacturers of buses and heavy vehicles. Thus, this geographical change can be seen as a product of globalization and its relations with local conditions and processes including post-socialist transformation.

The Upper Silesian Industrial District together with the neighbouring Bielsko-Biała, and partly Częstochowa and Krakow regions have developed as the core of the sector in the country with two car assembly plants, diversified supplier base and relatively strong non-production functions including R&D. The emergence of this new core area can be seen as a path-dependent process, the seeds of which were sown by locational decisions related to Fiat-licensed car in the 1970s, its early successful privatisation and the location of General Motors, which have triggered large foreign investment in the

area. Dolnośląskie is a major winner of the expansion of automotive component sector in the corridor of the A4 motorway close to German and Czech borders. Proximity to foreign markets, good road accessibility, industrial traditions (skills), infrastructure and special economic zone incentives are important factors behind the location of numerous new plants in south-western and western Poland, as well as to some extent in Podkarpackie. Institutional factors in the form of national policy together with attitudes and activity of local governments proved important to attract foreign corporations to industrial towns and regions and hence trigger the agglomeration processes fuelled later by imitation locational behaviour of further investors.

All this means that the advantages of industrial regions and towns prevailed. Foreign investors have not been discouraged by their structural and social legacy and negative image, and hence contributed to their structural change.

The study confirms the growing spatial concentration of automotive industry in Poland, which leads to the creation of a few strong agglomerations with a large number of producers embedded in extensive supplier networks. K. Gwosdz and G. Micek (2010) identified hub-and-spoke and TNC-led satellite platforms as the most frequent agglomeration types in the sector, but no Porter's clusters nor Marshallian industrial districts. As to the mechanisms of the spatial evolution of the automotive industry, agglomeration economies have been important in the formation of its structure in Poland, while rather limited role has been played by spinoff processes emphasized by Boschma and Wneting (2007) in the case of the Coventry-Birmingham region in the United Kingdom.

The surprising demise of the historically leading role of the Warsaw region, contrasting with the locational preference of foreign investors for the capital regions of many countries, general trends of the inflow of capital to the Warsaw metropolitan area and its fast economic growth since the 1990s, is contingent on individual events.

A significant change in the spatial pattern of Polish automotive industry contrasts with the general continuity in its geographical distribution in many countries. For example, Hardi et al. (2014) point out that foreign export-oriented investment in Romania and Serbia has contributed to the development of the major clusters of the automotive industry formed in the past, outside the capital cities. The motor vehicle industry in the United States remains largely concentrated in the vast region called auto alley extending between the Great Lakes and the Gulf of Mexico. However, auto alley was only formed in the 1980s, whereas earlier most of automotive component production was concentrated in the much narrower area of the Central Manufacturing Belt between Milwaukee and Buffalo with the core in south-eastern Michigan (Klier, Rubenstein, 2010).

Finally, it is worth noting that the identified trends in the geographical distribution of the automotive sector are in congruence with the general changes in the spatial pattern of Polish industry as a whole. Wielkopolskie and Dolnośląskie are two regions which have increased their share in the national industrial employment most of all since 1998, the role of Lubuskie has also risen. All these voivodeships have shown the fastest growth in value added in industry. The enhanced position of the historically industrialised regions of Wielkopolskie and Dolnośląskie has been emphasized earlier by T. Rachwał (2010) and B. Domański (2015). At the same time, the share of Mazowieckie in the industrial employment in Poland has decreased; its dynamic GDP growth by and large rests on the development of the service sector. The main difference concerns Śląskie as its general industrial growth rate was below the national average and its share in the national employment has lowered. This reflects the shrinking of the traditional sectors

such as coal mining and metal industries in the Upper Silesian Industrial District, where the rapid expansion of automotive industry has become an important factor of the successful restructuring.

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Research Topics and Changes in the Spatial Structure of Innovativeness of Polish Industry in 2005–2015

Abstract: The purpose of the paper was to synthetically characterise the changes of spatial differentiation of industry innovation in Poland in 2005–2015 in the context of research problems of innovativeness with the use of the cross product. The availability of data limited the scope of the research. For example, innovative activity was presented through the analysis of the share of innovative units in the total number of industrial enterprises and the size of expenditure on innovative activities incurred by industrial enterprises. The analysis of the share of innovative products in the value of total production and net revenues from sales of innovative products in net revenues from total sales was also made. The analyses mentioned were presented against the research and development situation in Poland as a whole and by voivodeship. Research confirmed that significant spatial diversity distinguishes the spatial structure of innovation in Polish industry by voivodeship. Moreover, it is significant that innovative expenditures show low efficiency.Spatial structure of industry innovativeness in Poland was highly stable in the analysed period. The changes in the spatial structure were insignificant and reached only 4% in synthetic terms. More substantial transformations of the structure, often of an abrupt character, concerned only the selected features of industry innovativeness.

Keywords: change of spatial structure; industry; innovativeness; Polish voivodeships; regional system; spatial differentiation

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Introduction

The article deals with the issue of spatial diversification of the level of industry innovation in Polish voivodeships in 2005–2015 in the context of the study of innovation in regional systems.

The development of the knowledge-based economy depends on the level of innovation of enterprises introducing new, significantly improved products, advanced technologies and better work organisation systems. High level of innovativeness of industrial entities also has a significant impact on increasing the competitive advantage of the entire economy, allowing it, above all, to use its resources more effectively. From the point of view of the possibility of long-term economic growth, they constitute endogenous sources of development based on the internal human and material capital of a given territorial unit. The increase in innovation, as well as the efficiency of the economy at its various levels, depends on many conditions, including the size and directions of expenditures on research and development, innovative activity in industrial enterprises and the degree of automation of their production processes.

The structural system should be understood as a set of elements ordered according to specific rules of their separation and grouping, and a set of relations existing between these elements. Structural changes bring an increase in labour productivity and have a positive impact on the economic growth of countries and their regions. The contemporary development of the knowledge-based economy makes analysis and assessment of the economy's structures regarding the degree of its modernity and innovation significant.

The study aimed to show selected issues concerning the innovation of Polish industry in 2005–2015, spatial diversification of industrial enterprises by voivodeship and an attempt to synthetically characterise changes in the spatial industry innovation system in Poland over the analysed period through the use of a simple vector calculation. Innovative activities were presented, among others, through analysis of the share of innovative units in the total number of industrial enterprises and the value of expenditure on innovative activities incurred by industrial enterprises per capita. An analysis was also made of the share of sold production of new and significantly improved products in industrial enterprises in the total value of sales and the share of net revenues from the sale of innovative products in total revenues. Complementing the characteristics of industry innovation in individual voivodeships was to determine the level of equipping industrial enterprises in the means of automation of production processes, which made it possible to determine the level of technological advancement of industry in individual voivodeships in the country. The research was, therefore, one-feature and quasi one-feature, i.e. taking into account the synthetic feature – consisting of a more significant number of features, the so-called meta-feature. The meta-feature included the following features: expenditures on R&D in industrial enterprises in PLN thousands, number of employed in R&D in industrial enterprises, outlays for innovative activity in industrial enterprises in PLN thousands, the share of innovative products in the value of total production sold, and the number of production lines controlled by a computer. The scope of the issues accepted for the analysis resulted from the availability of data.

The conducted analyses became the basis for determining changes in the spatial structure of industry innovation in Poland in 2005–2015 from a synthetic measure through the use of the vector calculation mentioned. The discussed analyses were presented against the research and development situation in Poland and individual voivodeships. Hence, the study also included spatial analyses concerning, among other things, expenditures on the research and development sphere. The innovative activity also included R&B activities, which were not directly related to the creation of a specific

innovation, but created an environment conducive to its creation (*Podręcznik Oslo*..., 2008: 49). Carried-out analyses concerned innovative enterprises, i.e. those that during the analysed period introduced at least one product or process innovation (new or significantly improved product or a new or significantly improved process).

Methods and sources of data

The applied method of studying structural changes was the type of one-feature research (taking into account one feature) or quasi one-feature (taking into account the synthetic feature – composed of a more significant number of features, the so-called meta-feature). The study used both one-feature and quasi one-feature research.

The meta-feature was expressed in the form of a synthetic measure following the procedure of ordering linear spatial units (Zioło, 1985; Runge, 2006). To determine change in the spatial structure of industry innovation, the vector calculation was applied under the procedure proposed by J. Parysek (1976). "A synthetic measure, and at the same time an image of the spatial structure of industry innovation in particular years, is the column vector K'_j (K'_1, K'_2, ... K'_n) as a vector carried in m-dimensional Euclidean geometric space. The measure of changes in the spatial structure is the angle between two vectors, for two different time sections carried in the m-dimensional space. For practical reasons, the angles between two vectors are replaced with the cosines of these angles. This function takes values in the range from –1.0 to +1.0. Thus, the cosine of the angle between two vectors carried in the m-dimensional space is the quotient of the value of these vectors above their scalar product", which is expressed by the formula (Parysek, 1976):

$$\cos K'_j K'_k = \frac{K'_j \; K'_k}{|K'_j| \cdot |K'_k|}$$

where: $$K'_j K'_k = \sum_{i=1}^{m} c'_{ij} \, c'_{ik}$$

$$K'_j = \sqrt{\sum_{i=1}^{m} c'^2_{ij}} \qquad K'_j = \sqrt{\sum_{i=1}^{m} c'^2_{ik}}$$

The arcsine cosine calculated then allows determining the magnitude of the angle between the vectors, which then allows determining the dimension of the change in the structure under examination. In the interpretation of the applied method, the value of the cos function $K'_j K'_k = 1.0$ means constancy of the structure, $\cos K'_j K'_k = -1.0$ complete inversion of the structure, $\cos K'_j K'_k = 0.0$ is the 50% transformation of the structure, while $K'_j K'_k = 0.7071$ is a 25% change. The features adopted for the analysis for their comparability were normalised using the following formula:

$$c'_{ij} = \frac{c_{ij}}{\sum_{i=j}^{m} c_{ij}}$$

where: c'_{ij} – means a standardised element of the matrix P', i.e. a matrix formed after the transformation of the information matrix of the output data.

The vectors created in this way show the participation of the spatial unit in the studied phenomenon in individual years. The classification of voivodeships in terms of their participation in the national structure of the studied phenomenon was a complementation to the synthetic characterisation of changes in the spatial system of innovativeness of Polish industry using the above-presented vector calculation. As a criterion for the division, participation rates were adopted concerning the average share and standard deviation (Parysek, 1976). The source of data regarding the analysed features was information available in the local data bank.

Innovation as a factor in the development of the economy

The issue of innovativeness has significantly gained in importance in recent years, both in scientific discussions and in practice. The popularity of this theme, however, has contributed to the ambiguity of the concepts used and the difficulty in establishing a uniform research methodology. The scope of issues addressed in the framework of innovation research is also extensive. It applies to enterprises, various types of spatial units and numerous aspects of the economy.

In the theory of economics regarding the creation of new scientific achievements, two basic approaches have been formed. The former emphasises the importance of the demand side while the latter – the supply side.

The demand concept is that the primary factor creating innovations are the needs, whose recognition and subsequent transmission of information about their existence from the market to research and scientific institutions causes the process of creating new products, technologies, services, etc. (Schmookler, 1972). In 1912 A.J. Schumpeter created the basis for the supply approach and developed a model of innovative activity, in which the emphasis is placed on the inflow of new ideas from outside science to enterprises whose classic task is to implement innovations. As the industry evolves, Schumpeter has refined his model of stimulating innovation processes. He emphasises the so-called internal science, that is, own research facilities and laboratories of enterprises implementing innovations. External science (research units outside the industry) being an element of the surroundings here, has less influence on the implementation of innovations. Therefore the management processes in the enterprise are the driving force behind the creation of innovations (Schumpeter, 1995; Winiarski, 2002).

A synthetic description of the creation of individual models of the innovation process is presented by D. Marinowa and J. Philimore (2003). In Poland, the innovative environment model is widely understood as complex research, cultural and institutional infrastructure that creates an environment conducive to the emergence and dynamism of innovation (Markowski, 2005). The quality and level of education play an essential role in the creation and implementation of innovative solutions. The above-presented research problems have been undertaken in various studies concerning the role of science in economic development (Kukliński, 1997), in shaping a modern business

(Carnicky, Krupa, Skotny, 2011), developing creative industries and municipal systems (Stryjakiewicz, Męczyński, 2010; Stryjakiewicz, Stachowiak, 2010). In many studies, attention has also been paid to the importance of innovation in shaping the processes of economic development (Zioło, 2012).

The knowledge-based economy consists of a gradual transition from a material-intensive economy to one that uses the potential of science and information. Intangible assets, especially human capital, knowledge and new technologies gain in importance. Therefore, developmental opportunities are increasingly determined by human intellectual potential and knowledge associated with the latest achievements of modern science. The development of knowledge-based entrepreneurship largely depends on national conditions, favourable public policies and public awareness in this area. The increase in innovation and the introduction of new or significantly improved products or advanced technological processes contribute to the full use of existing resources, as well as increase the efficiency of the economy. Their effect is also the creation of new jobs and an increase in the competitiveness of enterprises and thus the entire regional economy. The high innovativeness of the economy is particularly important in the case of countries transforming their economic structures, to which Poland belongs. It allows for stimulating the process of modernising the economy and reducing the gap in the level of economic development in relation to the technologically advanced countries (Nowak, 2012; Brezdeń, Spallek, 2013; Murzyn, 2013).

The analysis of the structures of the economy or its parts can be considered in various systems. The structural system should be understood as a set of elements ordered according to specific rules of their delimitation and grouping, and a set of relations existing between these elements.

Structural changes bring an increase in labour productivity and have a positive impact on the economic growth of countries and their regions. Structural changes taking place in the objective (generic) system, which characterises the branch structure of the economy, are considered to be particularly important. An important role also lies in the institutional structure, which is of fundamental importance for the shaping of economic relations, as well as for the functioning of the economic system and the appropriate regulatory solutions. The next crucial structural system is the regional (spatial) structure, defining the distribution of elements of the national economy divided into different territorial units. This structure is the subject of research in this study.

The contemporary development of the knowledge-based economy makes analysis and assessment of the economy's structures regarding its degree of modernity significant. The changes taking place in the economy depend on the level of innovativeness of enterprises introducing new, significantly improved products, advanced technologies and better work of organisation systems. The high level of innovativeness of entities also has a significant impact on the growing competitive advantage of regional economies, enabling, above all, more effective use of resources (Zioło, 2010, 2012).

Innovation and changes in spatial systems

Innovative processes, their effectiveness and proper use, are of great importance for economic development. Especially at the regional level, the importance of proper identification and utilisation of endogenous resources determining internal innovation processes becomes more significant. Their diffusion within the region occurs when

participants involved in the process of shaping innovations (e.g. enterprises, scientific units, business support institutions, local and national government sectors) establish close relationships leading to the effect of feedback on regional innovation systems.

Innovativeness in the economy can be related to its various aspects, i.e. spatial and subjective. In the spatial aspect, innovation can be applied to the entire economy of the country or its regions. In the case of the subjective aspect, innovativeness focuses on enterprises and individuals (Wach, 2007; Zioło, 2010). The region's innovation should be understood as the ability of the socio-economic and institutional system to create, absorb and diffuse innovations (Olechnicka, Smętowski, 2007).

The level of innovation determines the competitiveness of regional economies, the most significant impact in the case of regions that are sources of knowledge (Golejowska, 2012).

The relations between enterprises, public authorities and scientific resources are presented in the triple helix model (Etzkowitz, Leydesdorff, 2000). In the model, as mentioned above, universities play a crucial role in creating innovative activity, alongside which the sphere of power and economic activity associated with the industry coexist. Numerous authors mention the importance of regional factors shaping the region's innovativeness and enterprises located in it. Some of them indicate that it is not possible to precisely distinguish the regional environment factors, macro-environment factors and factors related to the innovation policy, which can be included both in regional and general factors (Meyer-Krahmer, Gundrum, 1995; Sternberg, Arndt, 2000). Others, however, among the factors conditioning the development of learning organisations, explicitly mention regional factors responsible for the region's innovation. An example of the above view that gives a unique role to regional factors in shaping the innovation of areas is a study by A. Langendijk (2001). The author even calls the regional factors the "regional knowledge laboratory" (Langendijk, 2001). Regional factors play a particular role in creating innovative activities for small- and medium-sized enterprises (Pfirrmann, 1994). The similar significance of regional factors in innovative enterprises' activities and their development is proven by Ch. Oughton, M. Landabaso and K. Morgan (2002). This phenomenon is called the regional innovation paradox. Analysing the conditions of functioning of innovative enterprises in a given region, one should also refer to the territorial concepts of production systems, which – to put it simply – are geographically concentrated industrial zones. The same applies to the innovative milieu model, which in the 1980s was introduced by the French regionalist Ph. Aydalota (1986), and then developed by the GREMI research group (Groupe de Recherche Européen sur les Milieux Innovateurs), among others by the Swiss regionalist D. Maillat (2002). This model tries to incorporate into the framework of the theory various forms of interdependence that arise in a given area, and which, by combining very different elements, affect the development of innovation and the emergence of new technologies. Ensuring the conditions necessary for the existence of an innovative environment at the regional level leads to the creation of innovative enterprises, i.e. the emergence of innovative companies that emanate from the local environment. Therefore, regions referred to as regional production systems or innovative environments are a source of competitive advantage for the entities clustered in them.

In the present informative phase of the economy, the processes of change taking place in it simultaneously influence the functioning and transformation of its entities, cities and various spatial structures (Siłka, 2012; Dzikowski, 2017). In the regions of

Poland, as well as in other new EU Member States, the global trends of changes related to globalisation are also superimposed by their national conditions. Therefore, these processes create new conditions for the functioning of the essential elements of the economic structure, such as industrial enterprises (Rachwał, 2012). In order to achieve and maintain a competitive advantage on the market, these enterprises have to adapt to new, complex environmental conditions (more in Rachwał, 2008, 2009; Zioło, 2010). In the light of research, enterprises showing favourable conditions for development are those integrating into global industrial networks through investment processes carried out in them by a foreign investor, which translates into more significant opportunities in the field of technical and technological changes and the assortment of products and expanding access to domestic and global markets. An important role is also played by the financial resources of industrial enterprises, depending on the favourable financial and capital condition that determines proper financial liquidity. It allows for the allocation of adequate funds for the modernisation of the machine park and thus obtaining more competitive products concerning quality, function and price (Zioło, 2010). As a consequence, the factors and processes as mentioned earlier influence the development of diversified spatial structures of industry innovation with varying degrees of durability (Brezdeń, 2015).

Selected issues of R&D and innovative activity in Poland in analytical terms

The characteristic feature of economic structures is their variability over time. The structural characteristics usually determine the relationship between elements and the whole of the set. In this way, the structure of employment, production, as well as the region treated as an element of a more extensive system (country) or as a whole in itself is described (Klamut, 1996). The broader approach to the structure alongside the quantitative relation also includes quality relations. In this approach, structure research may include its effectiveness.

Structural changes in the economies of developed countries and international economic groups are expressed primarily in the reduction of production and employment in industries with old technology and declining demand for their products, and simultaneous acceleration of the growth rate in industries using modern technologies, for which the demand is growing. This trend is present in all developed industrial countries. However, the pace and scale of change are significantly different in them (Winiarski, 2002).

The main factors of these changes are, among others, development of science and technology. For this reason, a critical system characterising the economy is its structure assessed due to the degree of modernity of manufactured products and technologies used. The increase in innovation and the introduction of new or significantly improved products or advanced technological processes contribute to the full use of the resources possessed, as well as to increasing the efficiency of the economy.

Innovation under the Oslo methodology is the implementation of a new or significantly improved product (goods or service) or process, a new marketing method or a new organisational method in business practice, workplace organisation or relations with the surroundings (*Podręcznik Oslo*..., 2008: 48). As a rule, product, process, marketing and organisational innovation are distinguished. The study of the innovativeness

of industrial enterprises at the regional level, due to the availability of statistical data, is only possible about product and process innovation, which is why these categories were accepted for analysis. The set of entities by which the evaluation of the innovativeness of the economy was made are enterprises that introduced at least one product or process innovation (new or significantly improved product or new or significantly improved process) to the market during the period under consideration.

Innovative activity means all scientific, technical, organisational, financial and commercial activities that lead or are intended to lead to the implementation of innovation. Thus, the innovative activity also includes research and development (R&D) which is not directly related to the creation of a specific innovation, but develops a favourable environment for their creation (*Podręcznik Oslo*..., 2008: 49). Research and development activity is one of the most critical factors and conditions of innovative activity of enterprises. Its goal is to strive for continuous improvement of its operations, as well as identification of early opportunities and threats for the company.

According to Eurostat data, in 2015 internal expenditure on research and development in Poland accounted for 1.44% of the expenditure of all 28 European Union member states. Poland ranked 20th among the EU countries regarding the intensity of research and development projects, which was 2.2 times lower for Poland than for the entire EU. The intensity of R&D works in Poland concerning the EU-28 is lower by 1.03 p.p. In 2015, in Poland (as in Slovakia), the value of the indicator exceeding for the first time 1% of GDP was recorded. Despite the gradual increase in the value of expenditures on R&D to GDP from 0.57% in 2005 to 1.03% in 2015, this level is highly unsatisfactory (for more see Gajda, 2015). After converting the value of internal expenditures into R&D per capita in 2014, with 101.6 Euro Poland took the 23rd place among all EU-28 countries, where the average value of such expenditures was EUR 564.4 (*Nauka i technika*..., 2016).

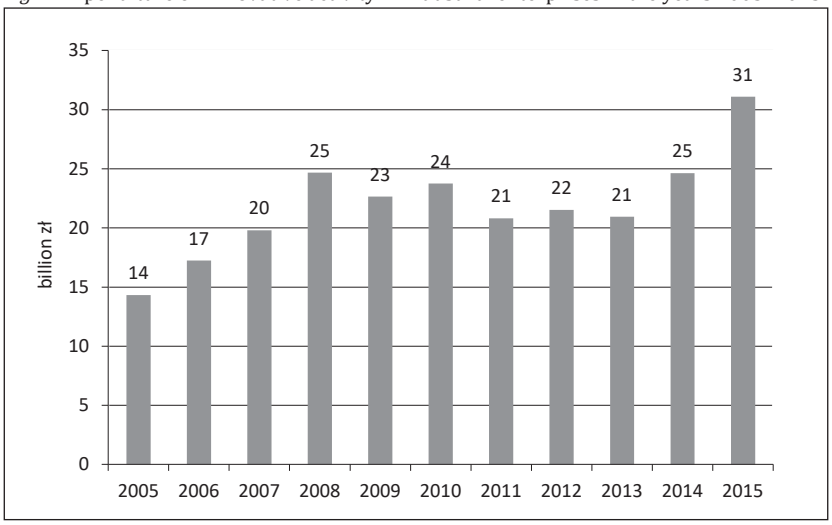
The gradual increase in R&D expenditures in the economy in 2005–2015 was accompanied by a more diversified increase in outlays on innovative activity in industrial enterprises. After a period of their gradual increase in 2005–2008, there was a decline in the value of innovative expenditure by 2013. a significant increase in expenditures took place from 2014, reaching in 2015 over 31 billion PLN. It accounted for more than twice the outlays on innovative activity from 2005 (Fig. 1).

The necessary parameters used in the analysis of the scale of research and development processes in the economy include indicators of internal inputs related to the creation of knowledge. These are Gross Domestic Expenditure on R&D (GERD), and Business Expenditures on R&D (BERD). They are related to Gross Domestic Product (GDP) (after *Nauka i technika*..., 2013). Despite the upward trend in recent years, their level in the entire Polish economy is highly unsatisfactory.

Expenditures on research and development activity show significant spatial differences by voivodeship (Fig. 2).

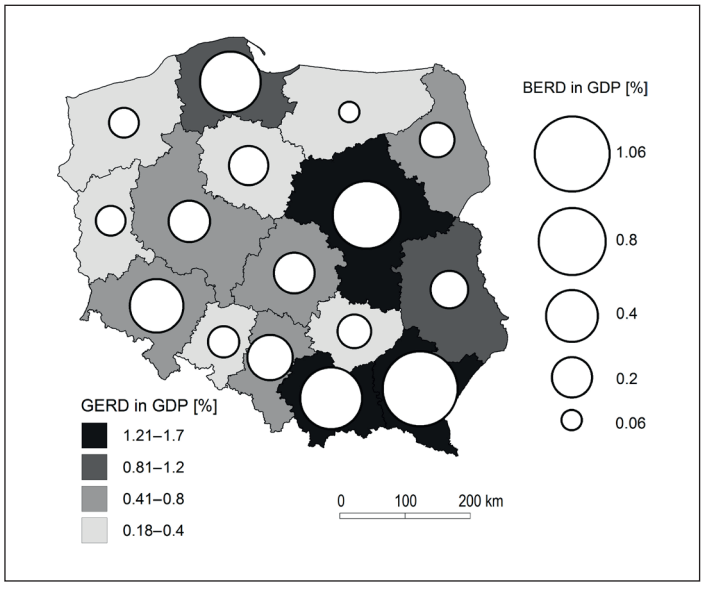
In 2015, the most significant expenditures on research and development (GERD) activities took place in Mazowieckie Voivodeship with a result of 1.7%. In this voivodeship, there was almost a quarter of all active research entities and 39.2% of the total number of scientific and R&D units. High values of the indicator were also characteristic for Małopolskie and Podkarpackie Voivodeships, which achieved the result of 1.38% of GDP each. The value of the GERD index above 1% was also recorded in the analysed year in Pomorskie (1.05%) and Lubelskie (1.03%) Voivodeships. Much lower values,

Fig. 1. Expenditure on innovative activity in industrial enterprises in the years 2005–2015



Source: own work based on *Bank Danych Lokalnych...* (2017)

Fig. 2. Total national expenditures on R&D (GERD) and expenditure on R&D in industrial enterprises (BERD) in 2015



Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2016)

between 0.41–0.8%, occurred in other, economically well, voivodeships: Dolnośląskie, Wielkopolskie, Śląskie and Łódzkie.

On the other hand, the following voivodeships showed the lowest values: Lubuskie, Warmińsko-Mazurskie, Świętokrzyskie and Opolskie. Spatial distribution of the GERD index did not correspond in all voivodeships with spatial distribution of the BERD indicator. The latter was significantly lower than the GERD index in all Polish voivodeships.

This relationship is characteristic of less developed countries, in which entrepreneurs find it more advantageous to acquire foreign technology rather than develop their own, which would require the mobilisation of abundant resources. In such economies, research potential is usually sustained by the public sector. Hence the expenditures of enterprises usually constitute a decidedly smaller part of GERD (*Diagnoza pogłębiona innowacyjności*..., 2012). The highest activity of industrial enterprises concerning expenditure on R&D was characteristic for Podkarpackie Voivodeship with the result of 1.06% of GDP. Mazowieckie and Małopolskie Voivodeships obtained the BERD result by half lower than in the case of the GERD index. In Lubelskie Voivodeship the BERD indicator was six times lower than BERD. This more significant gap in the case of the second parameter may indicate that an essential factor strengthening the intensity of R&D is the presence of public institutions in the region, which incur significant research and development expenditures. Dolnośląskie Voivodeship, concerning total research and development expenditure, was more active in industrial enterprises, which is a very positive phenomenon. It should be remembered that expenditure on research and development accompanies production investments that generate innovative products or technologies with high added value. The few investments of this type in the countries of Central Europe cause that these regions show low productivity, resulting from production with lower added value and low expenditure on R&D (Rachwał, Wiedermann, Kilar, 2009).

The share of innovative enterprises in industrial enterprises in total in 2015 was close to 14% in Poland. The most significant percentage of them was recorded in the voivodeships in the south-western part of the country (Śląskie, Opolskie and Dolnośląskie) and in Mazowieckie Voivodship. The lowest, on the other hand, was recorded in Świętokrzyskie, Lubuskie and Kujawsko-Pomorskie Voivodeships (Fig. 3).

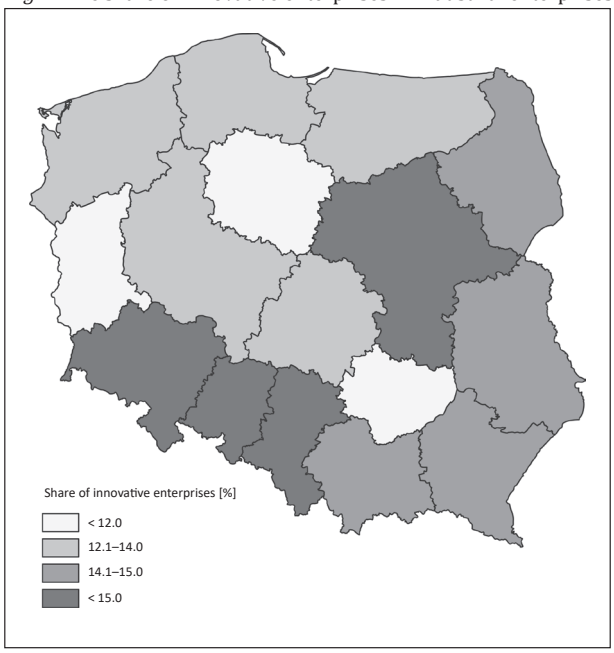
A relatively high share was also recorded in the voivodeships of eastern Poland. However, attention is drawn to the considerable decline in the share of innovative industrial enterprises in 2015 as compared to 2005 (Fig. 4).

In a national scale, it amounted to over 60% in the analysed period. In the regional system, the most substantial change was recorded in the voivodeships of the eastern and northern parts of the country. An unusually large loss of these enterprises (nearly 72%) took place in Świętokrzyskie Voivodeship, which at the same time belonged to the regions with the lowest share of innovative enterprises in total. Given the above, the economically weaker voivodeships, in which at the same time the share of these entities was smaller, showed a significant decrease in their share in the period under consideration.

An essential feature in the analysis of industry innovation is the expenditure incurred on this activity in industrial enterprises. Regarding expenditures incurred by these enterprises in PLN per capita, the most favourable situation in 2015 occurred in Mazowieckie, Łódzkie and Dolnośląskie Voivodeships, as well as regions located in the western part of the country (Fig. 5).

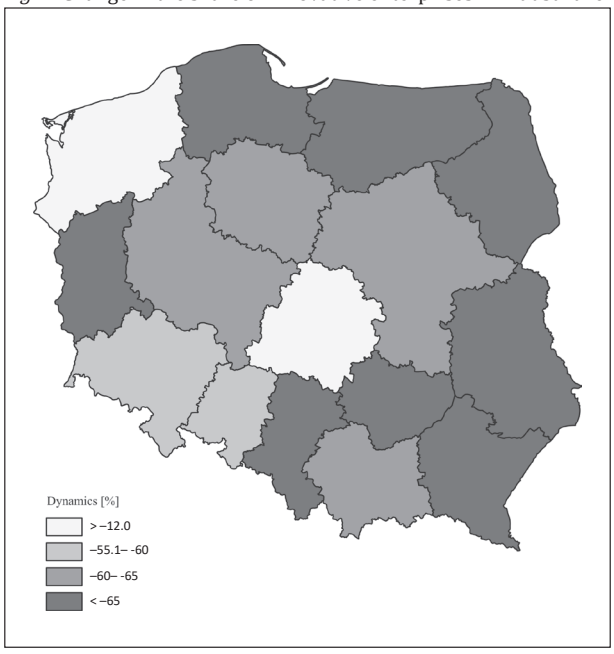
The lowest expenditures of less than PLN 400 per capita were found in the voivodeships of eastern and north-eastern Poland. In contrast to the share of innovative industrial enterprises in total enterprises in the case of expenditures incurred on innovative activity in virtually all voivodeships in the country, they increased in the analysed period (Fig. 6).

Fig. 3. The share of innovative enterprises in industrial enterprises in total in 2015



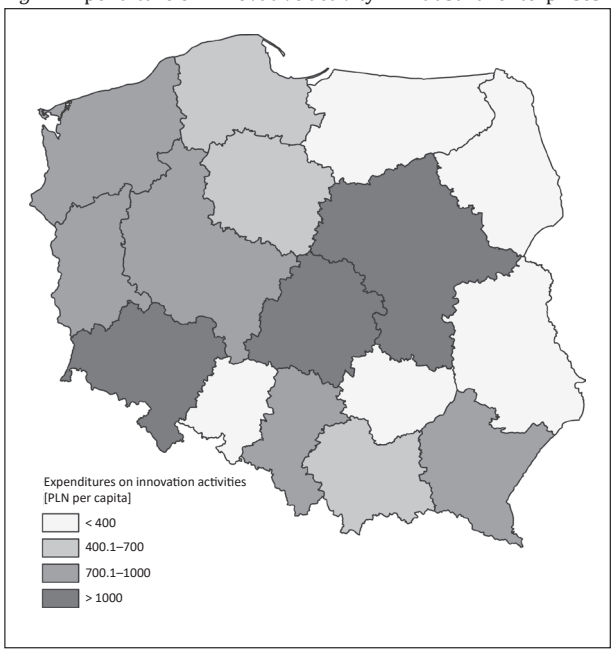
Source: own work based on *Bank Danych Lokalnych* (2017)

Fig. 4. Change in the share of innovative enterprises in industrial enterprises in total in 2005–2015



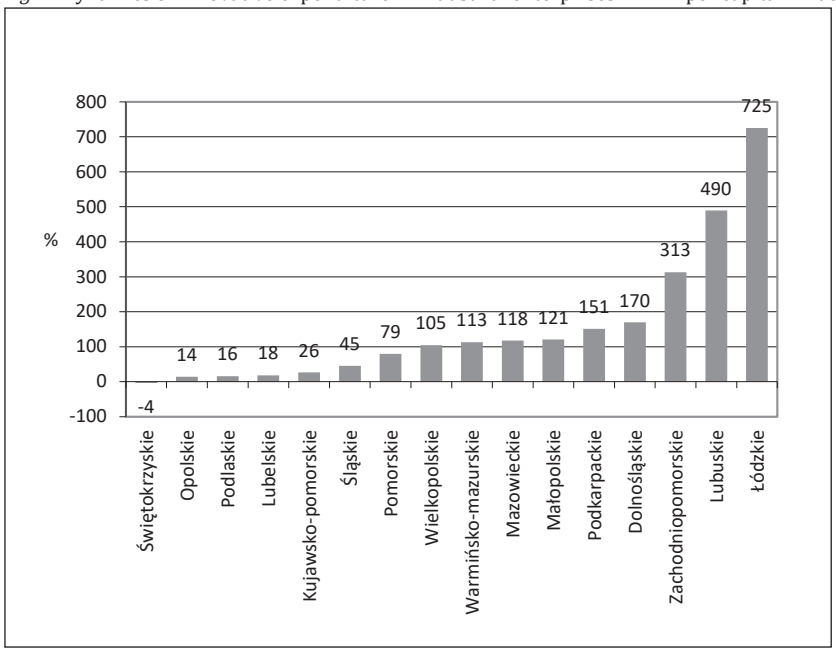
Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2013, 2016)

Fig. 5. Expenditure on innovative activity in industrial enterprises in 2015



Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2016)

Fig. 6. Dynamics of innovative expenditure in industrial enterprises in PLN per capita in 2005–2015



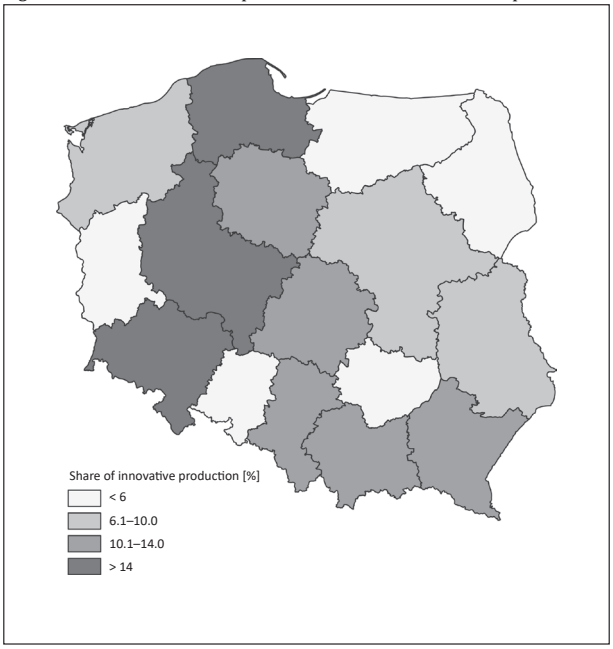
Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2013, 2016)

The largest was recorded in Łódzkie, Lubuskie and Zachodniopomorskie Voivodeships. However, it should be emphasised that the mentioned administrative units had low values of expenditure on innovative activity in 2005. The only region in which the expenditure on innovative activity dropped was Świętokrzyskie.

An important parameter used in particular for the assessment of the effects of innovative activities of industrial enterprises was the share of sold production of new and significantly improved products in the value of total production sold. The share of the production mentioned above is not high in Poland (more in Nowak, 2012). In 2015, it amounted to 12.5%. The spatial structure of the share of innovative production in the value of total production sold was also significantly diversified by voivodeship (Fig. 7).

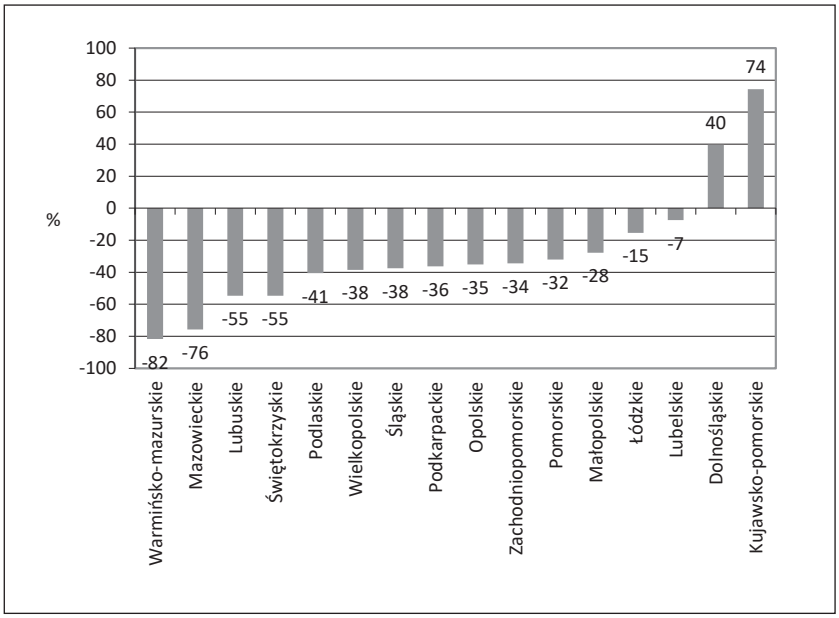
The most significant share occurred in Pomorskie, Wielkopolskie and Dolnośląskie Voivodeships where it amounted to over 14%. Relatively high values of this share were also present in the following voivodeships: Śląskie, Małopolskie, Podkarpackie, Łódzkie and Kujawsko-Pomorskie, and were at a level of 10–14%. The lowest share was recorded in Podlaskie, Warmińsko-Mazurskie, Lubuskie, Opolskie and Świętokrzyskie Voivodeships. In general, it did not exceed the level of 4–5% of the value of total sales in the mentioned voivodeships. Changes in the share of sold production of new and significantly improved products in the value of total production sold in 2005–2015 were very unfavourable in Poland. The reasons are complicated, starting from the financial crisis that begun in the global economy in 2008. It influenced the investment and export sphere of companies with foreign capital operating in Poland, consolidating the position of the Polish economy as a subcontractor for many companies with German capital, which implement production in Poland that is in the phase of maturity and standardisation of the product lifecycle (more in Brezdeń, 2016). The processes mentioned earlier

Fig. 7. Share of innovative production in industrial enterprises in the total value of sales in 2015



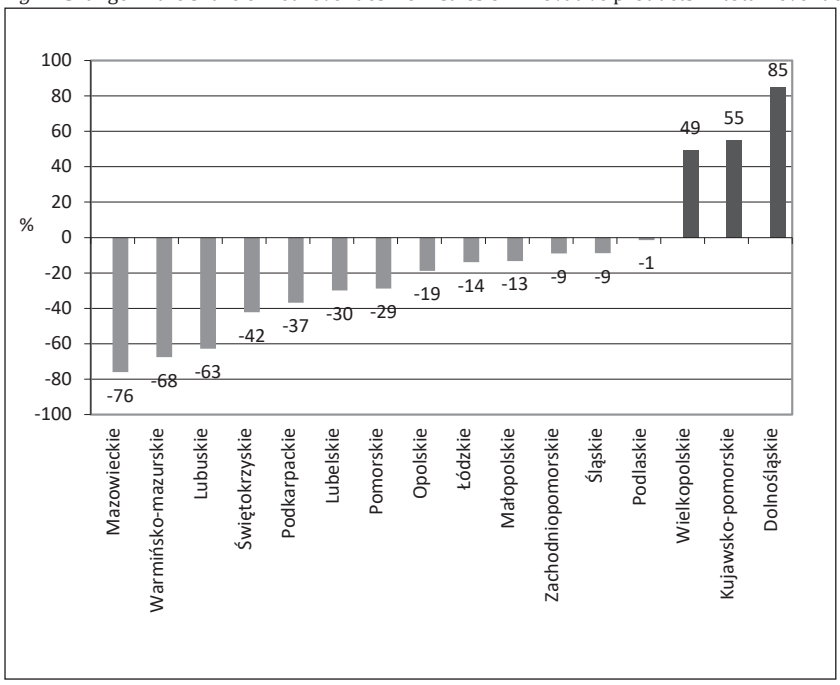
Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2016)

Fig. 8. Change in the share of innovative products in industrial enterprises in the total value of sales in 2005–2015



Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2013, 2016)

Fig. 9. Change in the share of net revenues from sales of innovative products in total revenues in 2005–2015



Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2016)

were also contributed by the decline in the share of innovative industrial enterprises in Poland in total enterprises mentioned in this article. The above-described processes influenced, among others, the significant drop in innovative production sold in the value of total sold production in 2015 to 2005. This share in the country scale decreased by nearly 45%. Thus, the above regularity occurred in the majority of the voivodeships of the country in the analysed period (Fig. 8).

The most considerable reduction in the share of the value of innovative production occurred mainly in economically weak voivodeships (Warmińsko-Mazurskie, Lubelskie, Świętokrzyskie) but also in Mazowieckie Voivodeship. On the other hand, increases occurred in two voivodeships: Dolnośląskie – by 40% and the largest in Kujawsko-Pomorskie – by 74%.

The spatial distribution of the share of innovative products sold in the value of sold product in total in 2015 corresponded to the spatial diversity of the share of net revenues from the sale of innovative products in total revenues. It is another parameter showing the effectiveness of innovative expenditure in industrial enterprises. In this case, in the studied period, the change in the share of revenues from innovative products showed high similarity with the change in the share of innovative products sold in individual voivodeships. The most significant decrease in the share was characteristic of Mazowieckie Voivodeship, followed by Warmińsko-Mazurskie and Lubuskie Voivodeships. The region of voivodeships with the increase in the share of revenues from the sale of innovative products, Dolnośląskie and Kujawsko-Pomorskie Voivodeships was joined by Wielkopolskie Voivodeship (Fig. 9).

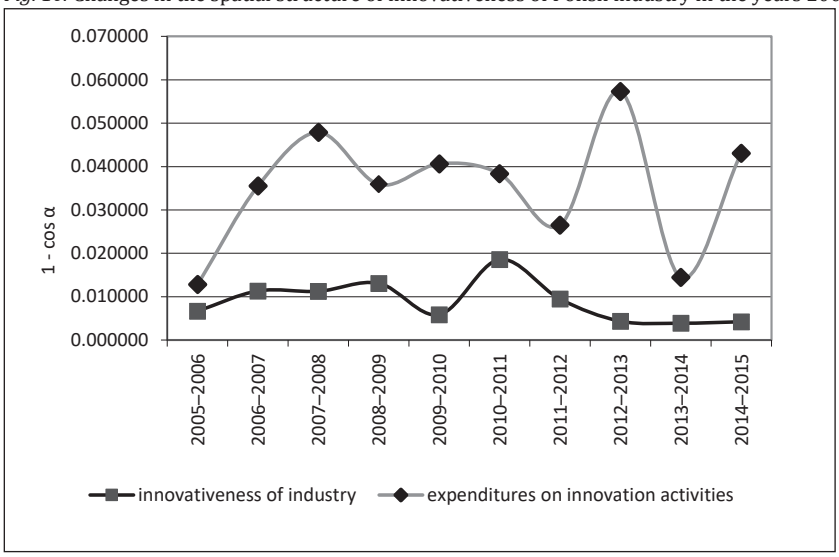
Changes in the spatial structure of innovation in the Polish industry in synthetic terms

In the economical-geographical studies of the structure of spatial systems, the analytical side of the issue dominates, as evidenced by the first part of the present article. It was devoted to selected issues of innovativeness of the spatial structure of the Polish industry by voivodeship. Attention was drawn to the analysis of elements of industry innovation creating specific spatial structures and changes in them in 2005–2015. However, they did not allow to determine the overall change of the studied phenomenon in a given period. Therefore, in the following part, an attempt was made to synthetically characterise the changes in the spatial system of industry innovation in the mentioned years. Conducting synthetic research results from the conviction that other types of changes characterise the system as a whole, than those that particular concern elements of the spatial layout.

The spatial structure of innovation of Polish industry in the analysed period was determined by the share of particular voivodeships in the total size of meta-features in quasi one-feature research and the volume of expenditures borne by industrial enterprises for innovative activities in one-feature research.

In 2005–2015, the spatial structure of industry innovation in Poland showed very high stability. Changes in the spatial structure on the basis of meta-features accepted for the research were insignificant, which is indicated by $\cos_{2005,2015}$ amounting to 0.993306. The calculated arc cosine function gives an angle of 6°63'. This means that the spatial structure of innovativeness of Polish industry in 2015 had changed only slightly, i.e. in less than 4% as compared to 2005. To determine only the size of the

Fig. 10. Changes in the spatial structure of innovativeness of Polish industry in the years 2005–2015



Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2013, 2016)

changes in the spatial structure of industry innovation in individual years of the period 2005–2015, a slightly different interpretation had to be given to the calculated function cos $K'_j K'_k$. The measure of changes in the structure is expressed by (1 – cos $K'_j K'_k$). The analysis of the results shows that slightly larger structural fluctuations (in the case of small ones in the entire period) took place in 2010–2011 and 2008–2009. In terms of the period 2012–2013, changes in the spatial structure took on the character of small, fixed-size changes (Fig. 10).

In the analysed period, much more significant changes in the spatial structure took place in the case of expenditure on innovative activity in industrial enterprises by voivodeship. The analysis of the size of changes in the structure of inputs indicates that more considerable structural fluctuations took place in 2012–2013, 2007–2008 and 2014–2015. However, the minimum structural changes concerned the years 2005–2006 and 2013–2014 (Fig. 10). The mentioned structural changes had an abrupt and irregular character, which may confirm the ad hoc and non-systemic nature of innovative activity in the analysed period. In the case of expenditure on innovative activity in industrial enterprises in the years 2005–2015, the spatial structure was less stable than in the case of the whole set of innovation characteristics, as evidenced by $\cos_{2005,2015}$, which amounted to 0.956757. The calculated arc cosine gives an angle of 16°91'. It means that the spatial structure of expenditures on innovative activity in Polish industry in 2015 changed in less than 10% in relation to 2005. However, greater stability of spatial distribution of other features reduced the impact of changes in innovative expenditure in enterprises on changes in the entire industry innovation structure.

An expression of the substantial stability of the spatial structure of the innovativeness of Polish industry in the analysed period is also small changes in the classification of voivodeships from the point of view of their participation in the national structure of the studied phenomenon. In 2015, only Lubelskie Voivodeship shifted from the average share class in 2005 to the small share class (Tab. 1).

Tab. 1. Classification of voivodeships from the point of view of participation in industry innovation

Share	Voivodeship 2005	Voivodeship 2015
low	Lubuskie	Lubuskie
	Opolskie	Lubelskie
	Podlaskie	Opolskie
	Świętokrzyskie	Podlaskie
	Warmińsko-mazurskie	Warmińsko-mazurskie
	Zachodniopomorskie	Świętokrzyskie
		Zachodniopomorskie
medium	Łódzkie	Łódzkie
	Kujawsko-pomorskie	Kujawsko-pomorskie
	Lubelskie	Pomorskie
	Pomorskie	Podkarpackie
	Podkarpackie	
high	Wielkopolskie	Wielkopolskie
	Śląskie	Śląskie
	Mazowieckie	Mazowieckie
	Dolnośląskie	Dolnośląskie
	Małopolskie	Małopolskie

Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2016)

However, more substantial shifts were observed in the classification of spatial units from the point of view of their share in innovative expenditure in industrial enterprises (Tab. 2).

Tab. 2. Classification of voivodeships from the point of view of the share in expenditure on innovative activity in industrial enterprises

Share	Voivodeship 2005	Voivodeship 2015
low	Lubuskie	Lubelskie
	Opolskie	Lubuskie
	Podlaskie	Opolskie
	Świętokrzyskie	Podlaskie
	Warmińsko-mazurskie	Warmińsko-mazurskie
	Zachodniopomorskie	Kujawsko-pomorskie
	Łódzkie	Świętokrzyskie
medium	Kujawsko-pomorskie	Zachodniopomorskie
	Lubelskie	Łódzkie
	Dolnośląskie	Pomorskie
	Pomorskie	Podkarpackie
	Małopolskie	Małopolskie
	Podkarpackie	
high	Wielkopolskie	Wielkopolskie
	Śląskie	Dolnośląskie
	Mazowieckie	Mazowieckie
		Śląskie

Source: own work based on *Bank Danych Lokalnych* (2017) and *Działalność innowacyjna...* (2016)

In this case, transfers to other share classes concerned a more significant number of spatial units. The voivodeships that shifted from the average share class in 2005 to the low share class in 2015 included not only Lubelskie Voivodeship but also Kujawsko-Pomorskie Voivodeship. Besides, Zachodniopomorskie and Łódzkie Voivodeships were upgraded in 2015 from the low share class to the medium share class, while Dolnośląskie Voivodeship joined the group of leaders with Wielkopolskie, Śląskie and Mazowieckie Voivodeships.

The research conducted indicates high stability of the spatial structure of the innovativeness of Polish industry with the dominance of voivodeships with large urban agglomerations and a developed industrial function having a significant impact on the innovative activity of enterprises located in their area (see Śleszyński, 2009). These regions often form a diversified research-scientific and economic environment and thus can foster innovative activities for industry. It should be emphasised that there is also no significant reduction in the disproportions in industry innovation or the distribution of expenditure on innovative activity for individual spatial units, as evidenced by the estimated volatility co-efficients for innovation in the industry in 2005 – 78.2%, and in 2015 – 77.8%. The same is true for innovative investments in industrial enterprises where volatility co-efficients were higher and amounted to 99.4% and 96.9%, respectively.

Also worth emphasising is the emergence of new spatial units that may soon join the leaders of innovative industry, such as Podkarpackie Voivodeship. The diverse type structure of business entities in its area with a significant representation of the production of communication equipment and chemical products, as well as the accompanying large BERD expenditures in relation to other voivodeships in the country can be the basis. The more so because the effects of outlays on R&D or innovative activity in industrial enterprises lag behind the period of their incurring.

SUMMARY

In the years 2005–2015 there was an increase in expenditures on R&D and innovative activity in Poland. However, the obtained values are highly unsatisfactory. The spatial structure of innovation of the Polish industry shows considerable spatial diversification by voivodeship. Despite a significant decrease in the share of innovative enterprises in total enterprises, in the majority of voivodeships there was an increase in expenditures on innovative activities. In most of the voivodeships, the decline in the share of innovative products in the total value of sales (with the exception of Dolnośląskie and Kujawsko-Pomorskie Voivodeships) was a disadvantageous phenomenon in the analysed period, and the share of net revenues from sales of innovative products in total revenues decreased (with the exception of Dolnośląskie, Kujawsko-Pomorskie and Wielkopolskie). It is worth noting the low effectiveness of innovative expenditure in the face of a progressive decline in the share of the value of manufacturing innovative products and a decrease in the share of revenues from their sale.

In the years 2005–2015, the spatial structure of industry innovation in Poland showed high stability. Changes in the spatial structure were insignificant. In the synthetic approach, the spatial structure of innovation in Polish industry changed only in 4%. An expression of the stability of the spatial structure in the analysed period are also small changes in the classification of voivodeships from the point of view of their share

in the national structure of the studied phenomenon. More substantial transformations of the industry's innovation structure (often of an abrupt and irregular nature) take place in the arrangements related to its specific characteristics, in particular outlays for innovative activity in industrial enterprises and between subsequent years of the 2005–2015 period.

The conducted research indicates the need to increase expenditures on research and development activities in Polish voivodeships, especially those carried out in industrial enterprises, increasing the efficiency of current expenditures on innovative activities in industry, as well as increasing investment attractiveness of weaker voivodeships (especially eastern and north-eastern Poland) to reduce disproportion of regional innovation in Polish industry.

The issue of the change in the spatial structure of industry innovation discussed in the study indicates the need to research regional approaches. The regularities identified as a result of such research provide the basis for more efficient management of the economy and enable undertaking actions aimed at the desired transformations of the spatial structures under examination.

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Attempt at Summarising Past Studies on Geographic Proximity

Abstract: The article is a review aiming to present the current research on the concept of geographic proximity and attempts to conceptualise it. The implementation of such a task required the identification of different ways of approaching the analysed issue, which was served by a systematic review of the literature, not performed on such a scale since the study of J. Knoben and L. Oerlemans (2006) (Micek, 2017). Proximity was captured in it using three types of logic: belonging, neighbourhood or similarity. Studies of proximity perceived as a value and trying to capture its intensity are rare. On the other hand, studies based on the proximity thresholds (most often expressed regarding physical distance) or affiliation to an administrative unit dominate. Meanwhile, proximity should be measured similarly as it is perceived and therefore using the logic of similarity. Therefore, there is a contradiction between the existing methods of measuring proximity and the essence of the concept itself. There is a need to capture proximity on a continuum that illustrates its intensity. The assessment of proximity, however, requires joint consideration of both objective and subjective measures, as well as the rejection of the thesis on the binary nature of the concept of proximity (Torre, Rallet, 2005).

Keywords: conceptualisation; distance; geographic proximity; neighbourhood; operationalisation; perception

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Introduction

In classic models explaining the distribution of services or industrial activities (by Christaller or Weber), the physical distance is an important determinant shaping spatial systems of the economy. Today, many authors emphasise the importance of a small geographic distance for facilitating the coordination of activities, especially innovative ones (Lagendjik, Lorentzen, 2007), and for maintaining personal contacts (Weterings, Boschma, 2009). Along with the development of ICT and shortening travel time, the end of the 20th century brought a sharp depreciation of the importance of distance as a factor

affecting the behaviour of enterprises and organisations. The importance of proximity in the non-spatial dimension (social, institutional or organisational) to regional development, innovation, interactive learning and knowledge flows was emphasised (Boschma, 2005; Torre, Rallet, 2005; Grossetti, 2008; Huber, 2012). Regardless of the conditions, the above dimensions of proximity may be considered as complementary and even substitutive to geographic proximity (Agrawal, Cockburn, McHale, 2006; Aguiléra, Lethiais, Rallet, 2012). The tendency to undermine the importance of proximity in spatial terms was visible among Western European geographers, which led to the separation of the discipline from the sources of classical spatial economics. Thus, a research trend called the economics of proximity was born (Carrincazeaux, Lung, Vicente, 2008; Sokołowicz, 2013, 2015; Bouba-Olga, Carrincazeaux, Coris, Ferru, 2015). The best summary of the last dozen or so years of reflection on geographic proximity is the classic statement by R. Boschma (2005: 62) that "geographic proximity per se is neither a necessary nor sufficient condition for learning to take place". Despite the agreement of Western European geographers about the limited role of proximity, the analysed concept itself is so fuzzy and ambiguous that it requires attempts to clarify it. It is also P. Śleszyński (2014) who indicates the definitional disorder concerning accessibility, mobility and proximity.

The article aims to present the current research on the concept of geographic proximity and attempt to conceptualise it. The implementation of such a task requires determining the differences between proximity and distance (Micek, 2017), which is difficult as often these concepts are identified with each other (most often in the operational dimension, not the definitional one). Therefore, the study also analyses the methods of operationalisation of geographic proximity. Presented review of literature is not limited to the latest studies but has also been referred to the classic literature of the subject, including previous reviews (Knoben, Oerlemans, 2006). The presented proximity and distance concepts include those by Polish and foreign authors. The basis for this concept presentation is a systematic review of 176 publications (Micek, 2017), of which 2/3 are articles published in journals indexed in the Web of Science database. The following discussion is based mainly on the evaluation of definitions and methods of measuring geographic proximity presented by English-speaking authors and the author's own considerations in this regard. This article contributes to the organisation of terminology and methods for assessing the level of proximity based on different logics. The author points out the contradiction between the existing measurement methods and the essence of the notion of proximity itself.

Current studies on geographic proximity

In literature on economic geography, one can distinguish three most popular fields of studies on geographic proximity. The most common theme of analysis is the influence of various dimensions of proximity on innovation, not very fortunately expressed by employing indicators of patent activity (e.g. co-patenting or patent citation). Geographic proximity between enterprises and its impact on the financial conditions, knowledge flows or regional development are less often researched. Single papers deal with changes in the importance of geographic proximity in the era of virtual communication (Cairncross, 2001) and include attempts to verify the metaphor of the "end of geography" or "death of distance".

The first papers that explicitly addressed the issue of geographic proximity appeared in the 1990s, especially after the publication of the special edition of the *Revue d'économie régionale et urbaine* (*Review of Regional and Urban Economics)* in 1993 (Bellet, Colletis, Lung, 1993). Since the mid-1990s, researchers started to emphasise that besides geographic determinants, social and institutional factors are also an essential component of proximity. Such reasoning gave rise to studies classified as the French School of Proximity (Rallet, Torre, 1999; Torre, Rallet, 2005; Torre, 2008), which introduced the notion of organised or organisational proximity, sometimes referred to as non-spatial proximity (Carrincazeaux, Lung, Vicente, 2008). At the same time, a thesis was developed about the need to include in the research the so-called temporary proximity occurring during various types of events, such as fairs, conferences, congresses, conventions etc. (Rallet, Torre, 1999). With time, more attention was paid to the different typologies of proximity, which resulted in the work of R. Boschma (2005) who distinguished its following dimensions: geographic, social, organisational, institutional, and cognitive. Some authors (Rodríguez-Pose, 2011) believe that inter-organisational proximity should be treated as a multidimensional variable. Nevertheless, R. Boschma (2005) argues that geographic dimension is different from the others and requires analytical isolation from the social, cognitive, organisational and institutional contexts. The work of R. Boschma (2005) gave rise to studies assessing the intensity of the impact of various proximity dimensions on the generation of innovations and knowledge interactions (Lagendijk, Lorentzen, 2007; Balland, Vaan, Boschma, 2013). Recently, two review studies have been published; they collect the existing arrangements of the economics of proximity and indicate research challenges (Bouba-Olga, Carrincazeaux, Coris, Ferru, 2015; Balland, Boschma, Frenken, 2015).

In the analysed trend, the most common are single ties (so-called dyads) depicting relationships between people (e.g. inventors, see Agrawal, Cockburn, McHale, 2006; Breschi, Lissoni, 2009; ter Wal, 2013; Cassi, Plunket, 2015) or organisations (enterprises, science-research units – Giuliani, Bell, 2005; Boschma, ter Wal, 2007; Giuliani, 2007; Morrison, 2008; Balland, 2012, Broekel, Boschma, 2012). A serious, albeit widely used, simplification is the recognition of interpersonal or inter-organisational relationships as links between countries, regions, cities or metropolitan areas.

Conceptualisation of the notion of proximity

In comparison to other dimensions, the concept of geographic proximity seems to be easy to understand and conceptualise. However, there is no distinct definition of geographic proximity (Eriksson, 2011), and few contemporary empirical studies include conceptualisation of this complex concept. Problems with operationalisation and conceptualisation of geographic proximity (Torre, Gilly, 2000) are accurately captured in the statement that *in fact, proximity is a notion that is poorly defined and even more poorly measured* (Aguiléra, Lethiais, Rallet, 2015: 799).

An essential element influencing the assessment of geographic proximity is distance. Usually, it has four dimensions: physical, economic, temporal, and social (Chojnicki, 1966; Gatrell, 1983), which can be measured as, respectively: distance in the Euclidean space, the cost of transport or energy consumed in it, travel time, and distances in a social network. In research in the field of economic geography, it is often forgotten that the postulate of the symmetry of distance is often not met, and equivalence of

relations in both directions is often assumed. Some authors add to the aforementioned types of distances those related to subjective feelings, e.g. difficulty in covering the distance captured by the effort related to the lack of comfort during travel or the risk of an accident (Komornicki, Śleszyński, Rosik, Pomianowski, 2009). A. Gatrell (1983) believes that it is crucial how man perceives distance.

Based on the concept of distance, proximity is undoubtedly a property of the relationship. G. Micek's research (2017) conducted in enterprises of the IT services sector shows that the perceived geographic proximity is strongly associated with the physical and temporal distance. However, it cannot be equated with the former. While the assessment of the level of proximity in the case of small distances is quite apparent, in the case of a greater distance (in Polish conditions of 200–400 km), it is more difficult (Micek, 2017). Research by Z. Taylor (1999) on the relationship between distance and time of transfer for commuting to workplaces and services in rural areas showed that despite the real relationship, road and time distances might differ significantly depending on different infrastructural conditions.

In addition to other features (such as the direction, importance and frequency of relationships, the degree of its symmetry, etc.), inter-organisational proximity is a feature of the interaction between enterprises. It can be determined using measures of similarity or affiliation. Paraphrasing P. Klimas (2012), this similarity should be expressed in the degree of co-sharing space occupied by independent entities. This approach brings geographic proximity closer to the one presented by A. Gatrell (1983), which distinguished the distance perceived by a human being determined by the similarity of attributes (*attribute proximity*).

Geographic proximity is a complex construct (Torre, Rallet, 2005), whose personal dimension is partly due to objective values, especially distance. By analogy with the divisions of space, we can distinguish the following two critical approaches to geographic proximity (Boschma, 2005): objective and subjective (based on distance perception). The former type of proximity shows as a real construct, defined in a given coordinate system, in which the physical, economic or temporal distance can be measured. Physical proximity results from the spatial accessibility of places and involves covering space, regardless of the individual features of its user (i.e. time or financial resources held, Taylor, 1999; Komornicki, Śleszyński, Rosik, Pomianowski, 2009). Subjective proximity, on the other hand, results from the perception of the real space and distance existing in it. This perception may result from own experience of covering a given distance. Sometimes, however, this subjective evaluation results from verbal relations of other people, media coverage or the picture of the distance based on books or magazines etc. Proximity in the subjective approach is not limited to the individual component (Komornicki, Śleszyński, Rosik, Pomianowski, 2009) of transport accessibility, nor is it based on determining availability of a given place, but, in contrast to accessibility, it also includes a subjective assessment, often taking into account, for example, high values of infrastructure indicators or network congestion. Exceptions to proximity perception studies include the understanding of the concept of proximity carried out in more than 1,400 small and medium-sized enterprises in Brittany (Aguiléra, Lethiais, Rallet, 2015), in which three types of geographic proximity have been distinguished:

- real proximity identified with the metric distance,
- perceived proximity (assessment of the level of proximity performed by the actors),

- so-called active proximity (conducive to communication and cooperation between entities).
- G. Micek (2017) writes that operationally, geographic proximity is recognised in literature in three ways. First of all, proximity is usually treated as a property of relations between two companies or territorial units (Boschma, 2005; Balland, 2012). Within this perspective, there are three methods of measuring geographic proximity:
- through a distance (physical, temporal or economic) between two actors or territorial units in which they operate,
- by their co-occurrence in the same territorial unit,
- in the notion of the neighbourhood of the administrative units in which these entities are located.

It can be assumed that the coexistence of entities in the same spatial unit is subject to the logic of belonging, while the measurement of physical distance or availability is part of the logic of similarity (Klimas, 2012). It seems, however, that in addition to the two aforementioned, there is a third, indirect, related, but distinct way of approaching proximity using the logic of neighbourhood.

For some authors, geographic proximity means the way in which distance is captured in the context of mobility (Torre, Gilly, 2000; Torre, Rallet, 2005; Haugen, 2012). Secondly, it is less frequent that proximity is treated as a company's property to other entities. In this approach, the notion of proximity is close to spatial (especially potential) accessibility and is sometimes perceived analytically using the potential or related method. Thirdly, least often, proximity is considered the property of a place (Capello, 2009). Such an incorrect, agglomeration-based and density-based approach is different from the previous two and simplifies the operationalisation of proximity too much. It is based on the assumption that the density of enterprises or employees reflects the mutual geographic proximity of economic entities in a given region (Gaczek, 2015). In this approach, proximity is treated as a measure of spatial concentration, not a relation between entities.

G. Micek (2017) shows that the analysed proximity dimension is most often referred to in the literature as "geographic", and in more than 1/4 of papers, erroneously, interchangeably as "geographic" and "spatial". Both G. Micek (2017), as well as J. Knoben and L. Oerlemans (2006) note that some studies even lack a description of what kind of proximity their authors write about, although the implication is geographic proximity. The term "spatial proximity" is less frequently used; it is most often used by German-speaking authors (Bathlet, Gluckler, 2003; Zeller, 2004), in most cases incorrectly as a synonym for geographic proximity. In Polish economic geography literature, the concept of spatial proximity is rarely used, with exceptions including studies of A. Tobolska (2017). According to G. Micek (2017), the term "geographic proximity" has a reasonably broad meaning and includes notions of spatial, territorial, local and physical proximities, though is not limited to them.

Operationalisation of the notion of geographic proximity

The biggest problem related to the use of geographic proximity is its too simplified measurement. In more than half of the publications in the field of economics of proximity analysed by G. Micek (2017), it boils down to using the most straightforward

measure, which is the physical distance between people or individuals. Frequent narrowing of proximity to physical distance is a considerable simplification. Physical distance (by some known as physical proximity – e.g. Kirat, Lung, 1999; Rallet, 2003) is not the best measure of geographic proximity, because it does not take into account the accessibility of places. A specific effort (time, cost or human) is needed to assess proximity, which must be put to cover the distance. The decisive factor here is the presence of physical, economic and social barriers. Physical distance is only one of the factors that influence the assessment of the degree of geographic proximity. Therefore, A. Healy and K. Morgan (2012) rightly distinguish geographic proximity from simple physical proximity.

Literature review (Micek, 2017) revealed that proximity is most often captured utilising physical distance, usually a simple Euclidean distance (*as the crow flies*), its reverse or logarithm (Laursen, Reichstein, Salter, 2011; Broekel, Boschma, 2012; ter Wal, 2014). In a similarly simplified approach, some use the Haversine formula, based on spherical cosine law (Hewitt-Dundas, 2013; Huang, Shen, Contractor, 2013). This approach reduces the measurement of geographic proximity to the spatial, physical distance because it does not take into account, for example, the use of the shortest (or average) distance in the road network. Geographic proximity cannot be reduced to a pure metric distance, which is a simplified, quantitative expression of the relationship between objects (Levy, Talbot, 2015). A small physical distance is only a signal that may or may not indicate potential geographic proximity.

It seems that the proximity measurement becomes even more simplified when the authors treat it as a binary feature. In this case, a zero-one matrix is used to indicate geographic proximity between entities – or lack thereof (farness). Moreover, in this situation, two values of geographic proximity are assumed: near and far. This view is aptly summarised by A. Torre and A. Rallet (2005: 49) who write: "It is binary: naturally, there exist infinite gradations (more or less far from, more or less close to), but the purpose of examining geographical proximity is to determine whether one is *far from* or *close to*". This dichotomous approach reduces the consideration of proximity to the two ends of its continuum without considering its intensity at all. When using a binary approach, an absolute threshold value should be adopted, which should separate proximity and farness. It can be assumed that it depends on the type of business activity analysed, the size of enterprises, the origin of capital, but also on the size of sales markets, the location of suppliers, etc. The adopted proximity thresholds are therefore highly diversified. The lowest accepted values are 0.5 km and 5 km (Eriksson, 2011). The first is to determine the location within the same business park where qualified employees could change their workplace. It seems that for the majority of production activities, this distance should be increased, e.g. for the automotive or pharmaceutical industries, an adequate threshold should be a distance of 5 or 10 km (Abramovsky, Simpson, 2011; Schmitt, Biesbroeck, 2013). According to R. Eriksson (2011), a radius of 5 km is a distance at which individuals and enterprises interact with each other more efficiently, and circles of such radius contain many small and medium towns. Travels to such distances are usually not difficult (Eriksson, 2011), and contacts are more accessible than in the case of more considerable distances. The most commonly adopted physical proximity threshold is 50 km. According to R. Eriksson (2011) and A. Weterings and R. Boschma (2009), it would define the subregion of daily activity of entrepreneurs geometrically. E. Stam (2003) believes it reflects the reach of the supralocal

labour market. Larger distance thresholds are rarely accepted. In the case of analyses of critical connections between star scientists or inventors, the assumed distances are 100 km (Schiller, Revilla-Diez, 2012) or 200 km (Crescenzi, Nathan, Rodríguez-Pose, 2013). It is recognised that the earlier distance allows the car industry to perform more than one delivery during the day (Schmitt, van Biesbroeck, 2013). In the case of the above studies, their primary weakness is bringing the proximity thresholds closer to physical distance.

In few studies which use social research methods to assess the level of proximity, some ranges of physical distance are usually assumed. As W. Tobler (2004) writes, it is also possible to use ordinal variables to measure distance (for example, assume the following values: far, further, furthest, close, closer, closest). In the research of small and medium-sized enterprises in Brittany, A. Aguiléra, V. Lethiais, A. Rallet (2015) used the following distance classes: below 5 km (ultralocal scale), 5–50 km (local), 50–250 km (regional) and over 250 km (national, i.e. of France). This approach seems the most appropriate if it is impossible to include proximity on a continuum. According to the author, proximity is not of a step nature, as confirmed by J. Blažek, P. Žižalova, P. Rumpel, K. Skokan (2011) who write about the existence of a continuous spectrum of proximity degrees.

The presence of two actors in the same spatial unit is used less frequently than a distance as a measure of proximity (Balland, Vaan, Boschma, 2013; Godart, 2015). This approach is based on the application of the logic of belonging. The administrative unit is usually the region (hence sometimes the term regional proximity appears – Fritsch, Schilder, 2008), and somewhat less frequently the country (e.g. in the research of the satellite navigation systems sector – Balland, 2012). The coexistence is also explored in a spatially concentrated cluster (Aguiléra, Lethiais, Rallet, 2012), in the urban functional area (Levy, Talbot, 2015), the most frequently designated commuting area (Crescenzi, Nathan, Rodríguez-Pose, 2013), in the same city (e.g. in the case of knowledge-intensive services – Aslesen, Jakobsen, 2007, or system of fashion houses – Godart, 2015). In the intracity scale, geographic proximity is also measured using a similar postal code (Beugelsdijk, Cornet, 2002).

Literature inquiry on publications dealing with the issue of geographic proximity (Micek, 2017) reveals that in a relatively small number of publications its spatial scale is specified in detail. Most often it is a local scale, rarely – a regional scale. The logic of belonging to the same administrative or organisational unit is used to analyse proximity in almost half of the publications. When applying this logic, one should be aware of the threats it brings. Proximity interpreted in the context of sharing a given administrative unit is by nature an artificial measure. To avoid simplifications related to the unnatural course of administrative boundaries and with the diversified size of countries or regions, coexistence should be examined not so much within the same administrative unit but in spatial clusters of enterprises of a given sector or related sectors, which often go beyond administrative borders. Parallel conclusions can be drawn in the case of a similar measurement method based on the logic of neighbourhood. In studies which use the concept of proximity, neighbourhood is usually understood as sharing a common administrative border: national, regional (Quatraro, Usai, 2017) or urban areas (Levy, Talbot, 2015). Neighbourhood as an indirect indicator of proximity is relatively rarely used in analyses.

In the assessment of the level of proximity a significant number of authors (Torre, Gilly, 2000; Shearmur, 2011; Balland, 2012; Aguiléra, Lethiais, Rallet, 2012, 2015) postulates the use of spatial accessibility (in terms of time or economy, not potential availability) generally understood as the possibility of a relationship between at least two points (places) (Śleszyński, 2014). Indicators based on temporal availability are relative and to a much greater extent reflect the possibility of relationships rather than measures based on physical distance (Śleszyński, 2014). In principle, however, the availability measures are not used in proximity economy. Exceptions include M.-C. Bélis-Bergouignan, C. Carrincazeaux, M. Grossetti, (2004), in which proximity ends at the threshold of one hour drive. The necessity of using time-based measures stems from the results of some proximity studies. C. Mason and R. Harrison (2002), researching the market for high-risk funds in the UK, noted that many fund managers said they did not want to fly to a potential partner for more than two hours by plane. The use of the time distance is also associated with the adoption of a certain threshold. It seems that in the case of research on inter-organisational relations, it should describe the actors' ability to arrange personal meetings within one business day (Rallet, Torre, 1998; Moodysson, Jonsson, 2007). The economic distance measured by travel costs is used even more rarely than the time distance in studies of geographic proximity. It should be stated that in the case of large enterprises, the cost of travel itself or, more broadly, maintaining the relationship may not be a barrier to searching for knowledge in the network (Borgatti, Cross, 2003). Nevertheless, R. Capello (1999) emphasises the need to include in the definition of geographic proximity the possibility of maintaining personal contacts without deterring their costs.

If proximity is a construct influenced by different distances and their perception, then the method of its measurement should not be limited to one variable. Despite the complexity of the analysed concept, only 20% of the publications analysed by G. Micek (2017) (Knoben, 2011; Aguiléra, Lethiais, Rallet, 2012, 2015; Ellwanger, Boschma, 2015) use at least two ways of approaching this construct. Most often it is a combination of coexistence in various administrative units (from the commune to the region, Balland, 2012; Ellwanger, Boschma, 2015) and spatial accessibility and coexistence (Aguiléra, Lethiais, Rallet, 2012, 2015). Such a rare use of several different measures indicates the weakness of current research which uses the concept of geographic proximity.

Summary – terminological and operational arrangements

Paradoxically, geographic proximity is a complex concept. R. Levy and D. Talbot (2015) rightly believe that proximity is not an easy construct for quality measurement. It seems that it should be clear that the relationship between actors is not limited only to a physical distance (Rodríguez-Pose, 2011). Very often, however, the proximity measurement is limited to the physical distance, which results in identifying these two values. As shown earlier in current studies of geographic proximity, its subjective (perceptual) dimension is rarely pointed out (Carrincazeaux, Lung, Vicente, 2008). The assessment of the level of proximity depends not only on objective variables (e.g. distances) but also on the assessment of the possibility of moving between two points and its perception by entrepreneurs (Lagendijk, Lorentzen, 2007). The objective dimension of proximity does not allow its overall assessment, as it often does not include mobility

and disregards the perception of distance. Not always a sizeable physical distance reflects farness (a low level of proximity), as demonstrated by G. Micek's (2017) research. A. Aguiléra, V. Lethiais, A. Rallet (2015) prove that distance perception from other partners assesses the proximity of the principal partner. According to the author, proximity as a relative and contextual construct is expressed precisely in the actors' perception of the distance separating the units in space (Torre, Rallet 2005; Carrincazeaux, Lung, Vicente, 2008; Micek, 2017). It is because people value objective distances: physical, temporal and economic. The perception of physical distance is less available than objective measurement, and it indeed depends on the characteristics of the person issuing the judgment. Different people perceive distance differently, and the way of perception is determined by the knowledge of both objects and the path between them, as well as experiences of covering the distance. Opinions about distance are acquired during covering it (Miller, Wentz, 2003) and during a conversation with other people.

There are, in fact, no absolute measures or thresholds of proximity and farness. The assessment of the level of proximity is contextual, as it depends, among other things, on personal experience of covering the distance. In current surveys of geographic proximity, its subjective dimension is rarely noticed. The assessment of the level of proximity, therefore, depends not only on objective variables (e.g. distances) but also on its perception by entrepreneurs.

Proximity is most often captured employing three types of logic: belonging (to the same administrative unit), neighbourhood, and similarity (approach with the help of distance). In comparison to previous studies, the article distinguishes the logic of neighbourhood, which is different from the logic of belonging.

In subjective terms, the assessment of the level of proximity is based on the logic of similarity, while the logic of belonging is more often used to measure proximity. Therefore, there is a contradiction between the existing methods of measurement and the very essence of the notion of proximity. Besides, if we rightly recognise that proximity can be measured on a continuum, its determination with a single distance threshold, as is usually the case in literature, becomes too simplistic.

Concerning the studies of A. Aguiléra, V. Lethiais, A. Rallet (2015) and G. Micek (2017), there are several ways of operationalising geographic proximity (Tab. 1):

- objective physical proximity (measured through physical distance, co-presence of entities in the same spatial unit, or neighbourhood of administrative units in which they are located),
- objective temporal proximity (temporal distance),
- objective economic proximity (economic distance),
- objective spatial availability resulting from the three above-mentioned,
- perceived proximity (assessment of the level of proximity made by enterprises based on the perception of the first three metrics of distance from the partner),
- active proximity is fostering communication between enterprises.

At present, in the economics of proximity, the measures of temporal distance are relatively rarely used to assess its level. Such indicators, however, to a much greater extent reflect the possibility of relationships rather than measures based on physical distance. Moreover, in the previous analyses, it was very rarely attempted to capture the perceived proximity. The optimal and possible measurement of proximity should be based on the combination of temporal distance and perception measures.

Tab. 1. Existing methods of conceptualisation and operationalisation of proximity

Manner of conceptualisation and operationalisation of proximity	Used logic	Frequency of use in publications on the economics of proximity	Level of suitability of the measure as an indicator of proximity*
Physical proximity	Similarity	Often	1
Coexistence of entities in the same spatial unit	Belonging	Often	1
Neighbourhood of administrative units	Neighbourhood	Rarely	1
Temporal proximity	Similarity	Rarely	2
Economic proximity	Similarity	Very rarely	2
Spatial availability	Similarity	Very rarely	2
Perceived proximity	Similarity	Very rarely	3
Proximity fostering communication	Similarity	Rarely	3

Note: * – level of suitability measured on a scale of 1–3, where 1 – low level, 2 – medium level, 3 – high level.

Source: own work

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Public Statistics Resources as a Source for Research in Geography of Industry

Abstract: The article aims to present data resources for the needs of research in geography of industry in Poland. These sources can be independently obtained primary sources or secondary sources. Primary data have a unique value. They are collected for a specific purpose to solve a specific problem. They usually allow for a detailed description of the theme under investigation. As they are obtained directly from the surveyed entities during statistical research, they show timeliness and originality. In the research in geography of industry, primary data sources are used relatively rarely. It is mainly due to the time-consuming and costly nature of this type of research and the increasing difficulties in obtaining consent for research from respondents. Therefore, secondary data, which are the results of previous research, primarily by Statistics Poland, are especially popular. Statistics Poland, deals with issues useful from the point of view of the research in geography of industry, both in the form of surveys of the official statistics and as part of experimental studies. The article describes research carried out by Statistics Poland, which provides essential information about the industry and its location. Administrative data sources which may be helpful in this regard have also been mentioned. Public statistics has access to many of them. The area of interest of official statistics regarding data on industrial activities also refers to the data on the labour areas, which were created using the European version of the TTWA algorithm. The argument presented in this article proves that public statistics investigates a broad spectrum of phenomena related to industrial activities, and the results of these studies are and may be widely used by researchers in geography of industry.

Keywords: administrative data sources; commuting; geography of industry; labour market areas; public statistics sources

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Introduction

Geography of industry is an academic discipline whose particular interest is the analysis of changes in factors and shaping of the spatial structure of industry of various sizes of enterprises, as well as spatial changes of their concentration forms (groups,

centres, districts, complexes), including dispersed industry. The scope of research formulated in this way has been subjected to constant evolution because with the changes in the organisation of the socio-economic space, the thematic scope of the discipline is continually changing. While it was once an industrial plant, followed by a company, an industrial system and a production chain, now we are talking about global economic networks and, as a consequence, new forms of spatial organisation of industry. At the same time, difficulties in defining the primary research object are increasing. Indeed, industry is the sector of the economy in which – also under the influence of technological progress (especially new information and communication technologies) – the boundaries between industrial and service activities are getting blurred. It makes the attention of scientists more and more often focused on a functional and holistic approach to economic and geographic phenomena, and the problems of old geography of industry, in line with the global trend, is blending into the study of a holistically treated economic geography (Gierańczyk, 2014).

The evolution of geography of industry indicates that Polish researchers who are dealing with this discipline quickly react to changes in the surroundings and continuously update their research priorities. It is clearly shown by T. Rachwał's (2015) review of the themes of conferences devoted to the geography of industry organised under the aegis of the Industrial Geography Commission of the Polish Geographical Society. The object of interest of industrial geographers were both basic units of the spatial structure of industry (industrial plants), as well as forms of industry concentration (industrial centres and districts). The mechanisms of functioning of industry branches (e.g. agri-food industry) were analysed, as well as – in connection with systemic changes in Poland – the place and role of industry in the new management system and the transition from industrial to post-industrial development. An assessment was also made of the impact of transformation processes on the functioning of various types of industrial enterprises, as well as the condition of spatial and branch structures of industry.

In connection with Poland's accession to the European Union, much attention was paid to the transformation of industrial structures under the influence of integration processes. The problems of the functioning of industry in national and regional systems were also considered concerning the impact of various impulses flowing from the international environment. Progressive globalisation has guided research of geography of industry on the processes of servicing economy, in particular the tightening relationships between industry and dynamically developing service departments, such as communication, R&D, education, finance or tourism, as well as the impact of industry on the development of the information society, the role and functions of industry in economic structure in conditions of growing importance of innovation and building a knowledge-based economy. Due to the change in the situation of the global economy, the impact of the crisis on the functioning of enterprises and changes in the spatial structures of the industry was also examined.

The eclectic nature of modern geography of industry (Stryjakiewicz, 2001) gives it a new value. For the work of industry geographers to fulfil this role, data is necessary to monitor the studied phenomena; processed with statistical methods and tools, the data will become useful information.

The article aims to present data sources that are useful from the point of view of the needs of the research in geography of industry in Poland, as well as present the

selected phenomena describing industrial activity on the labour market based on the European version of the TTWA algorithm.

The European version of this algorithm was described in detail by Mike Coombs and Office for National Statistics (Coombes, 2015). The algorithm is based on the British method of Travel to Work Areas (TTWA), but it has been simplified compared to its earlier versions. The description of the algorithm can be found, for instance, in the Eurostat study (2015). In general, the construction of labour market areas is based on certain self-limitations of the areas. Gminas are combined in a specific way into clusters that potentially can create labour market areas (LMA). These self-restrictions apply to the minimum number of employees, the target size value, the level of self-limitation acceptable for larger clusters and their smallest acceptable size. The detailed way of determining the labour market areas in Poland (together with the encountered problems and solution proposals) has been described in the study of M. Ryczkowski and P. Stopiński (2018).

Public statistics resources for the needs of research in geography of industry

Information in the public statistics system is obtained using statistical surveys, both representative and full, whose stages of implementation are established and well described in the literature (incl. Aczel, 2000; Paradysz, Dehnel, Gołata, Klimanek, Szymkowiak, Witkowska, Witkowski, 2004; Witkowski, Szymkowiak, Witkowska, 2009).

Data sources for research in geography of industry can be obtained independently (primary data) or can be reused. Primary data have a unique value. They are collected for a specific purpose to solve a specific problem. They usually allow for a detailed description of the theme under investigation. As they are obtained directly from the surveyed entities during statistical research, they present timeliness and originality. In research in geography of industry, primary sources of data are used relatively rarely. It is mainly due to the time-consuming and costly nature of this type of research and the increasing difficulties in obtaining consent for research from respondents. Therefore, secondary data, which are the results of previous research, are especially popular, especially those gathered by Statistics Poland (GUS). Statistics Poland deals with issues useful from the point of view of research in geography of industry, both within the framework of the program of statistical surveys of official statistics and as part of experimental studies.

As part of the program of statistical surveys of public statistics, many aspects of industrial activity are examined at various levels of spatial aggregation. As a result of this research, Statistics Poland is in possession of a rich set of information describing industrial activities. Due to the full range of data held, a detailed analysis of this one of the most critical segments of the national economy can be carried out. Data collected by Statistics Poland concern the production activity of industrial enterprises, finances, labour market, investment activities, foreign trade in industrial products, fuel and energy and material management, research and development, use of information and telecommunications technologies, and environmental protection.[1]

[1] More detailed information on individual thematic areas is available on Statistics Poland website (http://www.stat.gov.pl) – in publications, the Branch Knowledge Bases (DBW) and the Local Data Bank (BDL), as well as on the websites of statistical offices.

Data on industrial activities can be obtained from various sources. However, care should be taken because the definitions, reference populations, the frequency of data collection and their representativeness may vary from study to study. The set of sources of data in geography of industry in Poland in a broad sense can include all studies in which data are collected in the Polish Classification of Activities – PKD [*Polska Klasyfikacja Działalności*] 2007 or at least contain information on PKD. These include, for example, labour market research, in particular such as Labour Force Survey – BAEL [*Badanie Aktywności Ekonomicznej Ludności*], National Economy Labour Force, National Population and Housing Census – NSP [*Narodowy Spis Powszechny Ludności i Mieszkań*], Remuneration Structure, Working Conditions and Demand for Labour.

In addition to research on the economic activity of population, censuses and other studies covering the labour market, it is necessary to distinguish research that focus on analysing information about industry. They form a possible set of data sources for geography of industry in Poland in a narrower sense. Relatively many studies of Statistics Poland can be mentioned here. Various aspects of industrial activities are included, such as Economic Survey – industry (AK-P), Business Survey – services (AK-U/m), Report on Economic Activity (DG-1), Report on revenues, costs and financial results and expenditures for fixed assets (F-01/I-01), Report on the status and movement of fixed assets (F-03), Production report (P-01), Report on production of goods and inventory (P-02), Annual company survey (SP) or Business Activity Report (SP-3).

Research included in the program of statistical surveys allows preparing, among others, information on industrial sold output for the current assessment of the production activity of industry, as well as the development of indicators of the condition of economy. Statistics Poland also researches the manufacturing of industrial products, turnover and new orders in industry, monitors changes in the shipbuilding and fuel industry, purchase and production of milk and milk products, as well as production, stocks and distribution of ethyl alcohol. In the field of interest of official statistics there is also the economic activities of industrial enterprises. One of the fundamental studies of Statistics Poland regarding industry is, for instance, the Statistical Yearbook of the Industry.

Separate research is devoted to the management of fuels and energy, including coal and lignite mining. Research is also being carried out to provide information on the electricity and heating sectors, enabling, among others, assessment of the functioning of the national power grid and its forecasting, as well as monitoring the level of the national energy security.

Statistics Poland also monitors issues related to the scientific and research potential, and studies the innovativeness of industrial enterprises. The increasing role of knowledge and innovation as driving forces for future development results in an increase in the demand for statistical data in this field, also in the context of assessing the level of innovation of the economy at national and regional level. One of the most critical factors of innovative activities used in the company's policy is research and development (R&D). The R&D departments that exist in most companies, as well as research and development units, are treasuries of knowledge, on whose effects and subsequent results competitiveness depends.

One of the dimensions of the effects of the R&D and innovation activities is the protection of industrial property in Poland. Statistics Poland publishes information on

patent statistics and intellectual property protection, with particular emphasis on the protection of industrial property in Poland (inventions, utility and industrial designs, trademarks, etc.). Applications and granted exclusive rights for inventions and utility designs in Poland are also monitored: in national and international mode, divided into domestic and foreign, and according to the International Patent Classification.

The public statistics also provides information on sectors showing the high intensity of the use of the R&D results. Among other things, it acquires and publishes information on production, employment and foreign trade according to the levels of technology. Research is also being carried out to assess the research and economic potential in the field of biotechnology and nanotechnology.

For economic development, the impact of industry on the environment is also essential. Statistics Poland research includes, among others, monitoring of industrial wastewater and its treatment, pollution and air protection, industrial and post-production waste, ionising and non-ionising radiation, and industrial and communication noise.

The price indices of sold production of industry are published cyclically. Statistics Poland also conducts qualitative research on the economic situation in manufacturing. The indicator of the general business climate reflected the mood among entrepreneurs regarding their economic situation concerning the current and predicted overall economic situation.

An essential area of official statistics that includes industrial activities is labour market and remuneration surveys. The labour market covers all issues related to shaping labour supply and demand, and transactions of labour purchase and sales, i.e. employing workers. Labour demand is represented by employers offering jobs, while job seekers represent supply. In this area, the Central Statistical provides data, among others, on economic activity of the population, the employed in national economy, the unemployed and job seeking registered in employment offices, demand for work, working conditions, accidents at work, work permits for foreigners in Poland, as well as population flows related to employment. In the area of remuneration, the examined areas include, among others, wages in the national economy and their structure by occupation, as well as labour costs. In this respect, a critical study by Statistics Poland is "The structure of remuneration by profession".

Despite the multitude of studies covering various aspects of industrial activity, research carried out as part of the statistical survey program of official statistics does not exhaust the information needs of users of the data, including researchers in geography of industry. It stems from the fact that, given the burden of research for respondents and costs, Statistics Poland carries out the majority of research on samples. The sample size in the survey is usually too small for generalisations to be made for small territorial units. Moreover, in geography of industry, the research problems refer to spatial systems. It is indicated by the generally accepted definition of geography of industry proposed by S. Misztal and Z. Zioło (1998) which states that: "Geography of industry is a scientific discipline dealing with spatial aspects (properties and problems) of economic activities, involving the extraction of raw materials and their processing into production and consumption goods, as well as the provision of repair services".

Administrative data resource as a source of data for the needs of research in geography of industry

Statistical surveys of official statistics covering a broad substantive scope of the analysed issues are costly. Their implementation is connected with a very high burden on respondents and the resulting increase in the number of missing answers and refusals to complete the questionnaire, even with the use of such methods of collecting information as CATI[2] or CAWI[3].

The use of administrative registers may provide information on the low level of aggregation with high frequency. Hence, in many countries, public statistics are increasingly assisted by administrative sources to examine the processes, phenomena and factors that affect the situation and trends on the financial market, the health of the population, and updates the research coverage (Paradysz, 2007; Komisja Europejska, 2011). Also in Poland, administrative systems are increasingly used as a source of data (Komisja Europejska, 2011; Gołata, 2012; Dehnel, Gołata, 2012; Ryczkowski, 2016). For example, A. Młodak (2014) pointed out the importance of using administrative registers to study commuting. Commuting is, in turn, an indispensable element for the construction of labour market areas. From the point of view of business statistics and geography of industry, registers created by the Ministry of Finance and the Social Insurance Institution seem particularly valuable. It is because they contain, among others, information about such variables as the TERYT symbol, PKD 2007 section, income and net income, cost and number of employees.

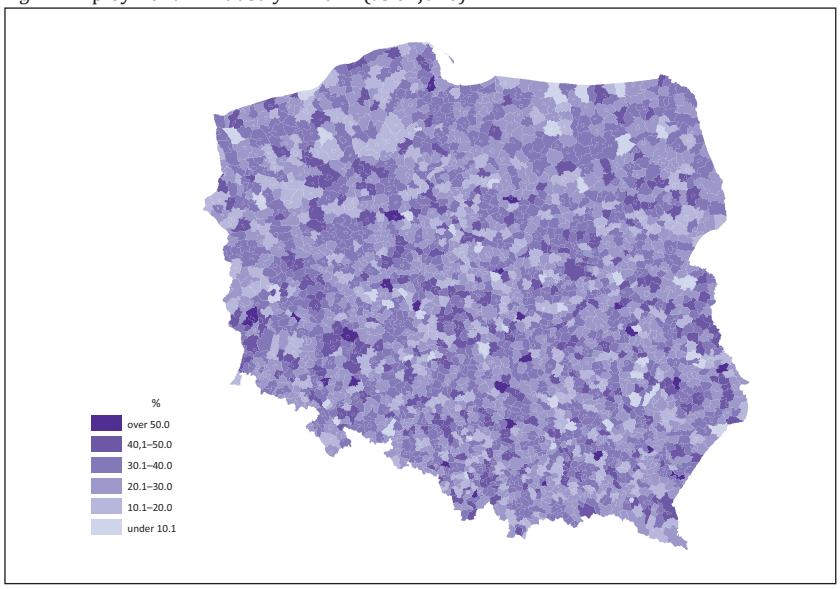
The experimental study, which was part of a research project entitled "Development of methodology and estimation of the number of employed in national economy by place of residence and main workplace at the NUTS level 4, registered unemployment rate at the NUTS level 5, and gross remuneration measure at the NUTS level 4", which was conducted with the participation of employees of the Statistical Office in Bydgoszcz who specialise in labour market research, indicates that administrative data is an excellent source of information about employees by economic sectors. The functional information obtained on the basis of this data at the lowest level of the administrative division, i.e. gminas, provide information on the spatial distribution of the employed in industry (Fig. 1) and the role of the industrial sector in the economy of individual local and regional systems (Fig. 2).

As it appears from the data presented in Fig. 1 and 2, in many Polish gminas, especially in the western part of Poland, the role of industry in employment structure is so significant that it is possible to indicate the dominant role of this function in the economic structure. The enterprises and industrial plants located on their premises create jobs, the management of which is often related to specific competencies of the workforce. The mobility of production factors plays a vital role in meeting the demand for labour. The flows of employees are described by the labour market theories, which indicate that in the modern market economy, the decision on the place where the work is undertaken is determined by both micro- and macroeconomic conditions (Jarmołowicz, Knapińska, 2011).

Relations between the place of work and the place of residence are the subject of public statistics interest. The result of the research carried out with the participation of

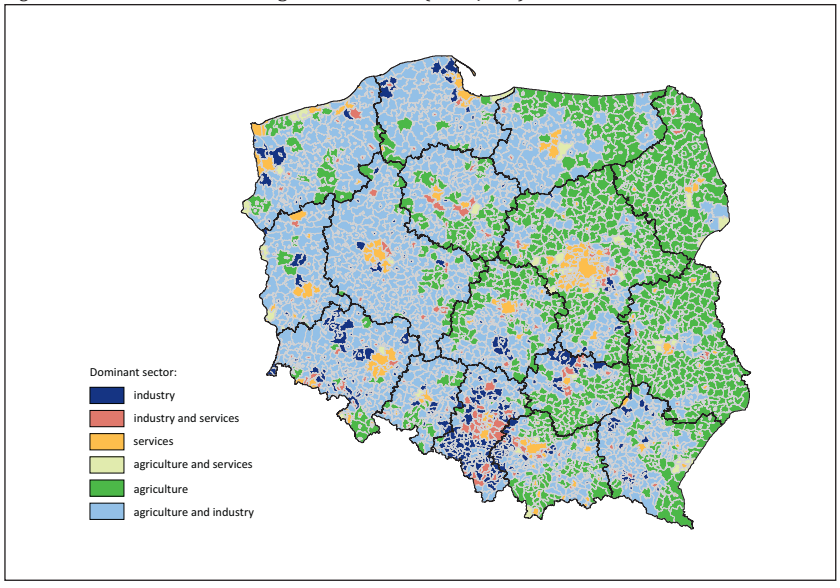
[2] Computer-Assisted Telephone Interview.
[3] Computer-Assisted Web Interview.

Fig. 1. Employment in industry in 2017 (as of June)



Source: own work based on experimental data from the study "Development of methodology and estimation of the number of employed in national economy by place of residence and main workplace at the NUTS level 4, registered unemployment rate at the NUTS level 5, and gross remuneration measure at the NUTS level 4"

Fig. 2. Functional character of gminas in 2017 (as of June)



Source: own work based on experimental data from the study "Development of methodology and estimation of the number of employed in the national economy by the place of residence and main workplace at the NUTS level 4, registered unemployment rate at the NUTS level 5, and gross remuneration measure at the NUTS level 4". The criterion for selecting the dominant sector/sectors was the percentage share of the inhabitants of a given gmina working in a given sector or group of sectors

employees of the Statistical Office in Bydgoszcz was the delimitation of labour market areas (LMA) in Poland based on the data on commuting. The methodology used was developed by Eurostat, together with the specially appointed working groups consisting of representatives of the EU Member States.

The LMA concept was initiated in the United Kingdom and Italy. It originated in no small extent from the idea of a functional impact of urbanised areas on the surroundings. It is based on the demand-supply interaction between individual areas. As a result, a comprehensive approach to the LMA is critical, e.g. for shaping regional development strategies. Indeed, this issue is of great practical importance and is the subject of research both in Poland (Gruchociak, 2012, 2013, 2015; Wdowicka, 2016) and in many other countries (Casado-Diaz, Coombes, 2011; Franconi, D'alò, Ichim, 2016; Kropp, Schwengler, 2016; Stimson, Mitchell, Flanagan, Baum, Tung-Kai, 2016).

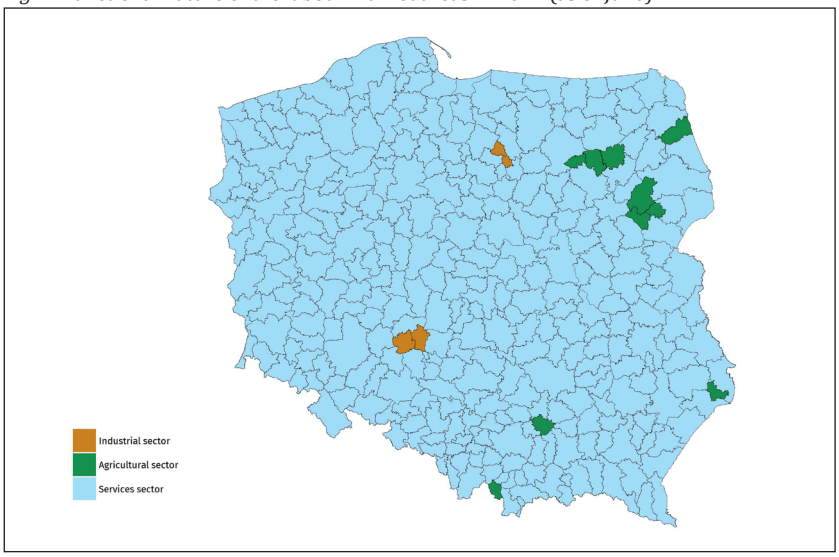
In general, the delimitation of the labour market areas is based on the designation of an area in which as many people as possible live and at the same time work, not crossing their borders during commuting. The LMA can be understood as an economically integrated territory in which residents can find jobs at a reasonable distance from their place of residence or can change jobs without changing their place of residence. The methodology adapted by the researchers from the Statistical Office in Bydgoszcz was based on certain self-limitations of unit areas (the data on gminas was used in the algorithm). Gminas were combined in a specific way into clusters that potentially could create LMAs. These self-limitations apply to the minimum number of employees, the target value of the size of the cluster (i.e. the minimum acceptable level of self-limitation), the level of self-limitation acceptable for larger clusters and its smallest acceptable size. Self-limitation should be understood as a smaller value of the labour supply indicator in a given area (the relation of the number of people living and working there to the number of inhabitants) and the demand index (the relation of the number of people living and working there to the number of jobs in that area). A detailed way to determine labour market areas in Poland has been described in the study of M. Ryczkowski and P. Stopiński (2018).

Practical interest in functional areas (Carlquist, 2006; Młodak, 2012; Śleszyński, 2013) results, among others, from research indicating the relationship between the situation on the regional labour market and prosperity. M. Ręklewski and M. Ryczkowski (2016) argue that with the improvement of the situation on the regional labour market, the quality of life in Poland is improving.

The division into labour market areas is an alternative to the administrative-territorial divisions of the country and surveys of clusters of economic activities, including industrial ones. In contrast to standard nomenclatures and classifications, the LMA is not based on historical and geographical conditions, but is delimited through the study of socio-economic characteristics. The need to distinguish LMA was developed because regions of the administrative division of the country do not coincide with naturally arising functional areas.

Labour market areas may be applied in the research that is in the sphere of interest of geography of industry. The element of the functional structure of the employed, presented in Figure 3, seems to be an interesting application example of the concept of functional areas, because the spatial distribution of industry does not necessarily coincide with the administrative division of the country. It seems that functional areas

Fig. 3. Functional nature of the labour market areas in 2017 (as of June)



Source: own work based on a preliminary survey entitled "Application of the EU methodology to define labour market areas in Poland"

are more suitable for this purpose, among which the labour market areas are one of the options. In the vast majority of the labour market areas, the service sector dominates.

As it appears from the above, the data from administrative registers have numerous advantages. They include low costs of obtaining them, low or zero responders' load, regularity in obtaining data, and high coverage of the surveyed population. Nevertheless, the increasing use of administrative sources (including possible research in the sphere of interest of geography of industry) tends to draw attention to the fact that, in addition to many of their advantages, they also have disadvantages. These include, in particular, different definitions in the administrative registers from those used in official statistics, and the scope of information limited to registration purposes. Besides, administrative records often have incorrect or missing data. In the case of data combination, their accuracy, timeliness and frequency may need to be harmonised with the surveys conducted by public statistics. Without such adjustment measures, the indicated differences may be a potential source of disturbances in the results obtained (Ryczkowski, 2015).

CONCLUSIONS

This article discusses the data sources relevant to research in geography of industry, with particular emphasis on secondary data. The conducted study proves that public statistics investigates a broad spectrum of phenomena related to industrial activities, and researchers in geography of industry widely use the results of this research. A significant limitation of statistics provided by Statistics Poland is their availability in local systems. To meet these expectations, public statistics undertakes work on obtaining data, including data from administrative sources, that provide essential information about industry and its location. The studies carried out so far indicate high usefulness of

this type of data sets and their applicability in delimiting labour market areas, i.e. functional areas of a socio-economic nature. This article can, therefore, play an essential role in the development of regional statistics and geography of industry.

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Proposal for a Holistic Concept of Research into the Functioning of an Enterprise and Industry

Abstract: In the process of shaping particular academic disciplines, there is a need to synthesise the existing research results and on their basis propose new methodological approaches and indicate the possibility of applying new directions of theoretic-cognitive and application research. This is the idea to which the theme and purpose of this paper refers. It proposes a new holistic research concept. The first part of the article reviews the hitherto research problems concerning the operation of an industrial plant (enterprise). Presented are the changing research concepts that initially treated the industrial plant as a landscape element, and then as a production plant affecting the processes of industry concentration, as well as socio-economic and cultural changes of the surroundings. In the second part, in the light of the theory of the dynamic system, the assumption was made that an industrial enterprise is not an isolated element of geographical space, but one of its functional components. Its role changes under the influence of endogenous and exogenous factors, as well as in the process of civilisation development. Using the idea of a dynamic system and the model of the functioning of geographical space, a new, holistic concept of research into the operation and development of an industrial enterprise is proposed. It includes various relationships: between the enterprise and the elements of geographical space (natural, socio-economic, cultural), between the rules of economic development, between different functional types of enterprises, competitive, between the categories of the environment, between the power elites and types of policies. The proposed model approach makes it possible to define various relations with the enterprise and allows for a comprehensive understanding of its functioning in a diversified surroundings, and it provides for the definition of a more precise strategy for its development.

Keywords: conditions for the development of enterprises; industrial company; industrial plant; spatial structure of industry

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Introduction

The 100th Anniversary of the Polish Geographical Society is an excellent opportunity to summarise the research achievements of individual geographical sciences, including geography of industry, but also to try to synthesise the current research achievements and present new analytical concepts that allow for more and more precise understanding of the processes shaping the geographical space. Proposals for further development and undertaking new research issues should refer to the changing conditions caused by the increasing progress of civilisation development, which in the geographical space affects the spatial polarisation of economic life and capital polarisation of the industry.

In the process of the development of geography, including geography of industry, similarly as in the process of development of individual scientific disciplines, there are subsequent stages associated with the pursuit of more and more precise understanding of the formation of geographical space and the way its essential elements function in it. It manifests itself in shifting from describing the object of cognition to explaining the process of its development, elaborating new concepts of developing models, defining development goals, improving research and verifying the methods of the accepted hypotheses, which then enable the construction of a theory.

Understanding the transformation processes of spatial structures is an essential premise for controlling development processes to increase the level and quality of life of the society. It becomes entirely possible thanks to a precise understanding of the conditions of the formation of the elements and relations that occur between them, which allow us to learn the laws (rules) that govern them. The rational management of the processes of change is the more effective, the more it is based on precisely justified theorems regarding the determination of the variability of the intensity of factors affecting the operations of change and the change of the potential. It is assumed that a set of views concerning a given field only then deserves to be called science, when there are fundamental theorems in it that allow justifying the derived assumptions (Domański, 1965, 2018). Such ordered sets of views create a theory that, among others in the field of geography of industry, can be expressed in the convention of the formation of dynamic systems (Zioło, 1976, 1987, 2008, Zioło, Rachwał, 2008).

It can be assumed that the future of geography of industry, as well as other scientific disciplines, depends in no small extent on the importance of the scientific problems solved by them (theoretical and application). Addressing them is necessary for the methodological development not only of geography of industry but also of the related disciplines which are interested in the geographical space or its selected elements, such as industrial enterprises. In addition to the theoretical and cognitive problems, the development of geography of industry is mostly connected with the possibilities of applying its research results in economic practice. It is done mainly by providing theoretically justified and empirically verified patterns that allow making rational decisions, implementing specific spatial policy objectives, assessing them and forecasting future transformation processes. Generally, it should be assumed that the role of geography of industry is related to its contribution to solving the theoretical, cognitive and socially critical scientific problems resulting from the transformations in the spatial structure of industry. The effectiveness of the proposed solutions depends to a large extent on the proper diagnosis, verification of the assumed development goals and precision of the developed research methods.

Therefore, there is a need for continuous work on the analysis of the variability of conditions for the development of industrial enterprises. It results not only from the pursuit of intensification of basic research but also from social needs, as well as the needs of management bodies which use the results of scientific studies for application purposes, e.g. building strategies for the development of local, regional and national systems, as well as understanding of the changing conditions taking place in the European and global space. Starting from the above assumptions, the subject of these considerations is the attempt to outline a proposal for a holistic concept of research into the functioning of an industrial enterprise as an essential element of the spatial structure of industry and national economy.

Outline of the review of research problems of an industrial enterprise

Theoretical concepts and research related to geography of industry regarding the transformation processes of the spatial structure of industry treat industrial enterprises (industrial plants) as their essential structural elements. Depending on the variability of their technical and economic potential, they affect the spatial layout of industry, its potential, branch and size structures. The concept of "spatial structure of industry" was introduced to Polish geographical literature by K. Dziewoński (1949), when dealing with issues of the production complex in the theory of location and planning practice. On the other hand, A. Kukliński (1959), considering this concept, stated that it was superior to the notions of "distribution of industry" and "location of industry".

We can treat the spatial structure of industry as "the totality of relationships between its elements". This concept assumes the existence of structural elements and their relations within a given set. K. Secomski (1956) and P.S. Florencea (1965), giving examples of various types of industrial structures, assume that the essential elements of the spatial arrangement of industry are industrial plants (enterprises). Their relations define the totality of relationships between the enterprises and plants regarding production and technology, economics, capital and market (Zioło, 1971, 1987, 1997).

In the light of these considerations, the term "spatial structure of industry" will be understood as one of the objective subspaces and part of the general socio-economic space characterised by a set of industrial plants (enterprises), the development of which is based on the intensity of technical, production, economic and infrastructural ties. These plants tend to cluster spatially, and – depending on their industrial potential and interrelationships – in the spatial structure of industry form specific sets, called spatial arrangements of industry concentration. This allows treating the spatial structure of industry as one of the elements of the socio-economic space, which in turn is an element of a more complex geographical space (Zioło, 1987, 1996, 2008).

In the process of developing geography of industry, the research issues of an industrial plant have changed. W. Ormicki (1934) treated the industrial plant as an element of the landscape. P. Stiepanow (1955), presenting the problems of research of an industrial plant, ascribed great importance to morphological analysis, which aimed to establish connections between the plant and the surrounding economic and natural environment. A. Kukliński (1954) and I. Fierla (1958) developed the concept of research of an industrial plant on the basis of technological, economic and location issues, as well as its connection with economic and geographical issues. The discussion on the problems

of research on a single plant was undertaken by M.S. Zawadzki (1962). He defined an industrial plant as the primary spatial unit of industrial production. The plant focused on the interdependencies between output and space, which made it difficult to find the right research goals and methods. They were mainly based on the separation of economic objectives and methods, as well as methods in the field of economic geography. He defined the geographer's competencies in solving problems relating to shaping the spatial conditions for the creation and development of an industrial plant, the interaction of the plant and industrial center, the plant's position in the region's economic and spatial structure and in a given branch of industry, and establishing the relationship between the economic activity of the plant and the local conditions of the geographical environment. B. Winiarski (1962) expressed some doubt about the ordering of the above problems. According to him, more attention should be paid to its functions in the scope of reconstruction of the socio-economic structure of the surroundings. I. Fierla (1962) assumed that in the research of an industrial plant, the sales, supply, production cooperation and linking of the plant to the region should be taken as an essential issue. An important role was also attributed to the research on the plant's links in the field of the workforce and the ongoing socio-occupational changes in its environment (Turczyn, 1968; Turczyn-Zioło, 1978). M. Dobrowolska (1965) took the position that – depending on the research objectives – the plant should be treated not as a fundamental element of the spatial structure of industry, but also as a primary element of the socio-economic space. Referring to methodological issues, she stated that the right way of geographical thinking led from the analysis of the work and production workshop to the analysis of the centre and the industrial area. The above thesis was reflected in the studies of "Her School of Science" (Pakuła, 1960, 1965). A certain summary of the research problem of geography of industry was presented by L. Pakuła (1967), who included the "Questionnaire for industrial plant research", in which, as the subject of geographical research, the following issues were taken into consideration: location issues, development history, issues of labour force, process of work mechanisation, production issues, factory supply in raw materials etc., product sales, technological process, production costs, positive and negative impact of the plant on the area and development prospects. The questionnaire of L. Pakuła was developed for didactic work by M. Troc (1991a, 1991b), who then adapted it to research of the agri-food industry plant. T. Rachwał (2008), using the rich literature of the subject and taking into account the change in the behaviour of industrial enterprises in the new conditions of management, developed a new questionnaire on the company's research. It included: general characteristics of the company, its location, development process in a historical perspective, characteristics of a strategic investor, linking of a foreign strategic investor with the enterprise, issues of employment relationships, size and range of production, technological process and quality of production, procurement of materials and services, sales, changes in the level and structure of costs, profitability of production, financial results, positive and negative impact on the surroundings, evaluation of the current change process and the company's development prospects.

In reference to the emerging trends of changes in the management system, an attempt was made to determine the research issues of the industrial plant as part of the studies of the Methodological Center for Teacher Studies (Zioło, 1988a). As part of the development of methodological concepts, the following were presented: new theoretical approach to the functioning and development of an industrial enterprise (Zioło,

1988b), the problems of locating industrial plants (Fierla, 1987, 1988, 1994a, 1994b), the location of plants and environmental protection (Dziadek, 1988), issues of labour force and employment (Turczyn, 1968; Turczyn-Zioło 1978; Ohme, 1988; Soja, 1988), production-spatial connections of an industrial plant (Troc, 1988), linking the plant with the elements of technical infrastructure (Makieła, 1988), as well as the themes of an industrial plant in geography teaching in primary and secondary school (Piskorz, 1988) and others.

Along with the changes in the management system, the conditions of socio-economic development have changed and new problems related to the functioning and development of industrial enterprises appeared (Zioło, 1994a; Domański, 1997). To a large extent, they also referred to the Report of the Commission for the Dynamics of Industry and Industrial Space of the International Geographical Union (Stryjakiewicz, 1994). They mainly concerned changes in the management system and the environment of industrial enterprises in new management conditions (Zioło, 1994b; Parysek, 1994; Kuciński, 1994, 2006, 2009; Pączka, 1994; Rachwał, 2003). Attempts have also been made to identify changes in empirical research, including: the possibilities of using the experience of the capitalist economy in creating a new order in the Łódź region (Niżnik, Riley, 1994), transforming the Toruń-Pacific Company LTD (Rochnowski, 1994), privatising (Matykowski, Szulc, 1994; Kozysa, Miszczuk, Żuk, 1994; Tobolska, 1994) and restructuring of enterprises (Rachwał, 2006), changes in the functioning of Słupsk industrial plants (Jażewicz, Rydz, 1994), meat plants (Adamczak, 1994; Rachwał, 2001a), electronic industry plants (Rachwał, 2001b), coal mines (Tkocz, 1996, 2006) and the development of individual business entities set up after the new act on economic activity had been introduced (Kamińska, 1994). T. Rachwał (2008), addressing the issues of the functioning of industrial enterprises, presented different approaches to researching enterprises in the field of geography and economics. He drew attention to the changeability of the conditions of changes in the functioning of enterprises and attached the previously mentioned updated questionnaire on the research of an industrial enterprise.

The outlined research problems of an industrial enterprise are complex, and this concerns various issues changing as a result of management processes. It is an extensive base that allows making further attempts to build the theory of conditions and development of industrial enterprises on the basis of geography of industry.

The concept of a holistic analysis of the conditions for the functioning and development of an enterprise and industrial activity

In the process of changes in the spatial structure of industry, depending on the attractiveness of spatial systems, the concentration of production and capital potential of manufacturing activity takes place. The production of increasingly complex products and diversified production costs in regional and national systems affect the intensifying processes of internationalisation of production, which affect the intensification of globalisation processes.

Industrial enterprises are not isolated elements, but operate in a specific place and belong to the essential elements of the spatial structure of industry but also to a more complex socio-economic and geographical space. In the process of functioning and

development, they show passive and active relations with the elements of geographical space (Tab. 1). On the one hand, the operation and development of a company are influenced, to varying degrees, by individual elements of the natural, socio-economic and cultural space, and on the other hand, the enterprise also evokes changes in its surroundings. This results from the location of a new business, emerging new production and service links, capital and finance links, in the scope of management, the use of specific resources for the development of production and the possibility of selling ready products. It is accompanied by the emergence and development of the existing business entities and institutions working for enterprises, but also the disappearance of economic entities that could not adapt to the new situation and the requirements of the emerging market. Enterprises influence their environment as a result of raising the technical level and implementation of new production processes, as well as by offering new products. This has a fundamental impact on the quality of the socio-economic and cultural potential, through the care of the higher quality of the staff, development of educational activities, improvement of the quality of services and public institutions, and others.

In the historical growth process, industrial activity played and continues to play a significant role in increasing the pace and directions of civilisation development. Spatially differentiated economic, social and cultural potential creates specific opportunities to dynamise its growth rate and structural changes, which leads to increasing disproportions in this area. The directions of development and the pace of intensification of production (industrial) activity are determined by the development of basic research, the use of which allows to develop scientific and research progress, and then laboratory work; undertaking experimental production, production on a semi-technical scale, technical and market production. An important role is played by the market, which usually develops or deepens as a result of a larger number of more modern and more economical products being offered.

The processes of geographical space development are the result of the impact of the operation of various economic rules that pursue specific goals. The activity of enterprises is governed by microeconomic regulations, in which the primary emphasis is put on maximising profit (Tab. 2).

The development of regional systems is being influenced by the rules of the mesoeconomics, whose primary goal is to increase the level of socio-economic and cultural development of regional structures. Regional structures are elements of national economy which develop on the basis of macroeconomic rules. On the other hand, specific groups of countries, connected by common economic or political goals (e.g. the European Union) are governed by mega economic rules. Global economy, along with the growing internationalisation of economic activity and the ever-increasing globalisation processes, as well as in the pursuit of limiting the adverse effects of socio-economic inequalities and the elimination of potential threats (incl. ecological and military) in the global space, are shaped according to the rules of global economy.

There are three categories of relationships among the rules of economic development. The first one is the relations taking place in the structure of particular rules of economic development, i.e. in the structure of microeconomic [e^e_{11}], mesoeconomic [e^e_{22}], macroeconomic [e^e_{33}], mega economic [e^e_{44}] rules and the rules of the world economics [e^e_{55}]. The second group presents active relations, which (in rows in the table) determine the impact of a given rule on others, e.g. the impact of microeconomic rules

Tab. 1. Conditions of the functioning of an industrial enterprise in geographical space

Passive relations				Active relations	
Geographical space	Natural space	Geological structure	Industrial enterprise	Geological structure	Natural space
		Climate conditions		Climate conditions	
		Water conditions		Water conditions	
		Relief		Relief	
		Soils		Soils	
		Vegetation		Vegetation	
		Animal world		Animal world	
	Socio-economic space	Agricultural structure		Agricultural structure	Socio-economic space
		Industrial structure		Industrial structure	
		Service network		Service network	
		Institutional network		Institutional network	
		Communication system		Communication system	
		Demographic structure		Demographic structure	
		Settlement system		Settlement system	
		Capital resources of the population		Capital resources of the population	
	Cultural space	Material culture		Material culture	Cultural space
		Spiritual culture		Spiritual culture	
		Aspirations of society		Aspirations of society	
		Education of society		Education of society	
		Intellectual resources		Intellectual resources	
		Social awareness		Social awareness	
		Cultural awareness		Cultural awareness	
		Political awareness		Political awareness	

Source: own work

Tab. 2. Relations between economic rules of economic development

Rules of economic growth		Rules of economic development				
		E_1	E_2	E_3	E_4	E_5
Microeconomic	E_1	e^e_{11}	e^e_{12}	e^e_{13}	e^e_{14}	e^e_{15}
Mesoeconomic	E_2	e^e_{21}	e^e_{22}	e^e_{23}	e^e_{24}	e^e_{25}
Macroeconomic	E_3	e^e_{31}	e^e_{32}	e^e_{33}	e^e_{34}	e^e_{35}
Mega economy	E_4	e^e_{42}	e^e_{43}	e^e_{44}	e^e_{45}	e^e_{46}
Global economy	E_5	e^e_{53}	e^e_{54}	e^e_{55}	e^e_{56}	e^e_{57}

Source: own work

(E_1) on the mesoeconomic rules is illustrated by the relation [e^e_{12}], macroeconomic – [e^e_{13}], mega economic rules – [e^e_{14}] and on the rules of the world economy the relation [e^e_{15}]. Similarly, macroeconomic rules (E_3) affect the following rules: microeconomic [e^e_{31}], mesoeconomic [e^e_{32}], mega economic [e^e_{34}], and world economics [e^e_{35}]. The third category, passive relations, show the influence of individual rules on a given rule (in table columns), e.g. microeconomic rules (E_1) are influenced by mesoeconomic rules [e^e_{21}], macroeconomic [e^e_{31}], mega economics [e^e_{41}] and rules of the world economy [e^e_{51}]. Similarly, the mega economic rules (E_4) are influenced by microeconomic rules [e^e_{14}], mesoeconomic [e^e_{24}], macroeconomic [e^e_{34}], and world economics [e^e_{54}]. Similarly, active and passive relations are illustrated by the next tables.

This means that the processes of enterprise growth and activity are the result of overlapping different rules of economic development, which may intensify development processes but may also have some conflicts between them. For example, companies pursuing the principle of profit maximisation seek to limit the size of various benefits (taxes, fees) for regional or national economy, and regional and national economy to achieve their development goals tend to increase them. Similar conflicts are visible in the EU structures. They are connected, among others, with the collection of funds to the common budget by individual member states and then with their division. As a consequence, the relations between the rules of economic development, affect the volatility of conditions that may contribute to the stimulation of production and service activities, but also may pose specific barriers to growth. Therefore, knowledge of these rules is essential for building a business development strategy for various categories of companies and industries, as well as regional and national systems.

Industrial enterprises do not constitute a homogeneous set, but they represent various branches of industry, which show a particular intensity of passive and active connections with specific elements of geographical space. At the same time, depending on the size of the economic potential and the extent of spatial links between production and service and market, they can fulfil the following functions: primary, complementary,

standard and local (Tab. 3). The primary (leading) functions are characteristic of enterprises with high technical and economic potential and working to meet the needs of the domestic, international or global market. Enterprises working for primary enterprises meet complementary functions. Enterprises with standard functions work mainly for the needs of the regional and supra-regional markets. On the other hand, enterprises with local functions are associated with supralocal and local markets. In the development process, individual categories of enterprises can change their functions in the economic space.

Tab. 3. Relations between functional types of enterprises

Functions of enterprises Z_1		Functions of enterprises			
		Z_2	Z_3	Z_4	
Primary	Z_1	z_{11}	z_{12}	z_{13}	z_{14}
Complementary	Z_2	z_{21}	z_{22}	z_{23}	z_{24}
Standard	Z_3	z_{31}	z_{32}	z_{33}	z_{34}
Local	Z_4	z_{41}	z_{42}	z_{43}	z_{44}

Source: own work

The development of enterprises' activities takes place in specific spatial arrangements (local, regional, national). In the process of locating enterprises, or in the search for new places of developing production activity, competitive relations between particular spatial systems intensify (Tab. 4). They occur between the same categories of spatial arrangements (e.g. between local systems) but also between other categories of systems (e.g. between local and regional systems, regional and national, national and European or global). Competitive relations of spatial layouts are manifested mainly in the level of accessibility and infrastructure development, the quality of financial institutions and legal instruments that enable effective production and service activities. Economic, international and spatial policy factors may also contribute to increasing the attractiveness for business development, aimed at, among others, stimulation of socio-economic development of less developed local, regional or individual countries.

An industrial enterprise operates in connection with various spatial environment categories (Tab. 5). They relate to links in the areas of financial, capital and technological flows, machinery equipment, spare parts, repairs, raw materials supply, cooperation supplies, energy and water supply, employment relations, sales of specific product groups, service activities, etc. Relationships between spatial categories of the enterprise and industry environment may change. Therefore, the stability of conditions and the ability to maintain and deepen market links, as well as the possibilities of seeking new relationships that reduce operating costs, are particularly important in this respect.

Tab. 4. Competitive relations between a given category of spatial systems

Spatial systems	Spatial systems				
	U_1	U_2	U_3	.	U_n
U_1	u_{11}	u_{12}	u_{13}	.	u_{1n}
U_2	u_{21}	u_{22}	u_{23}	.	u_{2n}
U_3	u_{31}	u_{32}	u_{33}	.	u_{3n}
.	.	.	.	.	.
U_n	u_{n1}	u_{n2}	u_{n3}	.	u_{nn}

Source: own work

Tab. 5. Relations between spatial categories of the company's market environment

Market environment P_1		Company	Local	Regional	National	European	Global
		P_2	P_3	P_4	P_5	P_6	
Company	P_1	p_{11}	p_{12}	p_{13}	p_{14}	p_{15}	p_{16}
Local	P_2	p_{21}	p_{22}	p_{23}	p_{24}	p_{25}	p_{26}
Regional	P_3	p_{31}	p_{32}	p_{33}	p_{34}	p_{35}	p_{36}
National	P_4	p_{41}	p_{42}	p_{43}	p_{44}	p_{45}	p_{46}
European	P_5	p_{51}	p_{52}	p_{53}	p_{54}	p_{55}	p_{56}
Global	P_6	p_{61}	p_{62}	p_{63}	p_{64}	p_{65}	p_{66}

Source: own work

An essential role in stimulating the business activity of enterprises and socio-economic and cultural development of enterprise systems is played by the quality and competence of elites that represent governmental, non-governmental and self-governmental administration, as well as representatives of political parties in power and in opposition. They can manage various categories of spatial arrangements, from the global and EU system, through national and regional systems to local systems. The functioning of the authorities may be a consequence of democratic rules of choice, of forceful taking over, or of imposing power by the interference of external factors. The elites of

power within a given spatial layout and representing different categories of systems may maintain positive, neutral or negative relations between each other (Tab. 6). The quality of the elites managing individual spatial systems is primarily influenced by intellectual resources, education level, personal aspirations and the will to develop the socio-economic and cultural management of the area while respecting ecological conditions. During the period of exercising power, they may create favourable conditions for the development of enterprises, stimulate the emergence of new business entities, affect the acceleration of processes of generating internal development factors and increase attractiveness for attracting favourable factors from the environment, but may also contribute to the weakening of growth and even recession.

Tab. 6. Relations between power elites

Power elites W_1		Global	UE	National	Regional	Local
		W_2	W_3	W_4	W_5	
Global	W_1	w^w_{11}	w^w_{12}	w^w_{13}	w^w_{14}	w^w_{15}
UE	W_2	w^w_{21}	w^w_{22}	w^w_{23}	w^w_{24}	w^w_{25}
National	W_3	w^w_{31}	w^w_{32}	w^w_{33}	w^w_{34}	w^w_{35}
Regional	W_4	w^w_{41}	w^w_{42}	w^w_{43}	w^w_{44}	w^w_{45}
Local	W_5	w^w_{51}	w^w_{52}	w^w_{53}	w^w_{54}	w^w_{55}

Source: own work

The industrial, economic, social, regional, European and global policies influence the process of enterprise development and the activity of industry. There are specific relations between particular policy types, which as a result of competition rules lead to an increase in the business activity of enterprises and individual industries, but also their stagnation, collapse or disappearance (Tab. 7). To a large extent, it depends on the degree of modernity of the offered products, the intensification of the quality of cooperative relations and changing market needs. In general, negotiations between politicians should aim at increasing the efficiency of production or service activities by developing investment activities, implementing modern production and management methods, socio-economic and cultural development, and raising the level and quality of life. As a result of the lack of coordinated goals and actions taken, particular types of policy may facilitate but also hinder access to mineral resources, capital and financial resources and the market.

The presented considerations indicate a very complex mechanism of functioning and development opportunities of an industrial enterprise and industry in the structure of the environment (Tab. 8). Three categories of relationships deserve particular attention in the management process.

Tab. 7. Relations between policy types

Policy D_1		Enterprise	Industrial	Economic	Social	Regional	European	Global
		D_2	D_3	D_4	D_5	D_6	D_7	
Enterprise	D_1	d_{11}	d_{12}	d_{13}	d_{14}	d_{15}	d_{16}	d_{17}
Industrial	D_2	d_{21}	d_{22}	d_{23}	d_{24}	d_{25}	d_{26}	d_{27}
Economic	D_3	d_{31}	d_{32}	d_{33}	d_{34}	d_{35}	d_{36}	d_{37}
Social	D_4	d_{41}	d_{42}	d_{43}	d_{44}	d_{45}	d_{46}	d_{47}
Regional	D_5	d_{51}	d_{52}	d_{53}	d_{54}	d_{55}	d_{56}	d_{57}
European	D_6	d_{61}	d_{62}	d_{63}	d_{64}	d_{65}	d_{66}	d_{67}
Global	D_7	d_{71}	d_{72}	d_{73}	d_{74}	d_{75}	d_{76}	d_{77}

Source: own work

Tab. 8. Conditions of the functioning of industrial enterprises

Types of conditions X_j		Enterprise	Functional types of enterprises	Elements of geographical space	Rules of economic development	Scales of spatial systems	Power elites	Types of policies
		Z_j	G_j	E_j	P_j	W_j	D_j	
Enterprise	X_i	x^x_{ij}	x^z_{ij}	x^g_{ij}	x^e_{ij}	x^p_{ij}	x^w_{ij}	x^d_{ij}
Functional types of enterprises	Z_i	Z^x_{ij}	Z^z_{ij}	Z^d_{ij}	Z^e_{ij}	Z^p_{ij}	Z^w_{ij}	Z^d_{ij}
Elements of geographical space	G_i	g^x_{ij}	g^z_{ij}	g^g_{ij}	g^e_{ij}	g^p_{ij}	g^w_{ij}	g^d_{ij}
Rules of economic development	E_i	e^x_{ij}	e^z_{ij}	e^g_{ij}	e^e_{ij}	e^p_{ij}	e^w_{ij}	e^d_{ij}
Scales of spatial systems	P_i	p^x_{ij}	p^z_{ij}	p^g_{ij}	p^p_{ij}	p^p_{ij}	p^w_{ij}	p^d_{ij}
Power elites	W_i	w^x_{ij}	w^z_{ij}	w^w_{ij}	w^e_{ij}	w^p_{ij}	w^w_{ij}	w^d_{ij}
Types of policies	D_i	d^x_{ij}	d^z_{ij}	d^g_{ij}	d^e_{ij}	d^p_{ij}	d^w_{ij}	d^d_{ij}

Source: own work

The first category presents internal relations taking place in the structure of particular conditions, e.g. the relations taking place in the enterprise structure – $[x^x_{ij}]$, relationships between economic development rules – $[e^e_{ij}]$, relations between power elites – $[w^w_{ij}]$ and relations between different categories of policies – $[d^d_{ij}]$.

Active relations are illustrated in the rows of the table, which present, for example, the influence of the company on the elements of geographical space – $[x^g_{ij}]$, on the power elites – $[x^w_{ij}]$ and the types of policies – $[x^d_{ij}]$. Similarly, the influence of the power elites on the enterprise is represented by the relation $[w^x_{ij}]$ and on the elements of geographical space – $[w^d_{ij}]$.

Passive relations show, for example, impacts on the enterprise by the elements of geographical space – $[z^x_{ij}]$, the influence of economic development rules – $[e^x_{ij}]$, of power elites – $[w^x_{ij}]$ and types of policies – $[d^x_{ij}]$. Similarly, the elements of geographical space are influenced by the rules of economic development – $[e^g_{ij}]$, power elites – $[w^d_{ij}]$, and types of policies – $[d^g_{ij}]$.

The potential and quality of development determinants of elements of geographical space and the relations that occur between them often create different opportunities for developing the activities of industrial enterprises. Favourable conditions in specific spatial systems lead to a spatial concentration of industrial enterprises and economic potential in their area, while unfavourable conditions deprive enterprises of the possibility of locating and operating enterprises. The consequence of this is the intensifying spatial polarisation processes manifesting themselves in the progressive diversification of the level of economic, social and cultural development of spatial systems that lead to the differentiation of the level and quality of life of the population.

An essential factor in the development of enterprises' operations is also the progressive process of concentration of capital occurring both in organisational structures and spatial systems. This process takes place both as a result of an increase in investment activity and an increase of the potential of a given enterprise, as well as through various types of mergers and acquisitions of similar companies or functionally related business entities. These processes affect the emergence of increasingly organised enterprises, which are currently represented by global industrial, service, capital, financial and the like corporations. They are based on efforts to monopolise economic activity, limit competition of other companies, strengthen their position on the market and, as a consequence, increase efficiency as a result of limiting the costs of production or service activities.

The outlined concept enables a comprehensive analysis of the functioning and development of an industrial enterprise and industry in geographical space. It is the basis for further studies related to the operation and development of various enterprises, as well as multiple branches of industry. It underlines the necessity of continuous and more and more precise studying of the complexity of the processes of functioning and transformation of enterprises, individual branches and the entire industry sector, in various spatial environment categories, as well as the impact of economic rules, quality of elites and implemented policies on their development. It should be assumed that as a result of scientific, research, technological and technical progress, there are better and better products that intensify the development of civilisation. It is accompanied by an intensifying process of concentration of management and capital, as well as the possibilities of deepening existing and acquiring new markets, shaping new or intensifying existing functional connections occurring in the structure of developing global

corporations, as well as between individual industrial enterprises and economic sectors.

The general wording is of great importance for application activities in the area of building and improving development strategies of enterprises, industry departments, as well as regional, national or European systems. The identification of functional connections between the company and its surroundings remains a particularly pressing problem, together with the issues to what extent the developing industry is a stable element of spatial structures and to what extent its potential may affect changes in the economic, social and cultural development of local, regional, national, European or world systems.

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