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Uniwersytet Mikołaja Kopernika/Nicolaus Copernicus University

ul. Gagarina 13A, 87–100 Toruń, Poland

Piotr Wiśniewski (contact person)

✉ e-mail: psw@umk.pl, <https://apcz.umk.pl/EiP>

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Contents

Marek Tomaszewski, Gabriela Tomaszewska

The innovation of enterprises and cooperation between science and business in the didactic aspect / **147**

Justyna Kujawska, Magdalena Olczyk

Effectiveness of European Green Deal implementation in EU countries: a DEA/Benefit-of-the-Doubt approach / **175**

Izabela Ostoj

The right to strike and its perception by society in the process of digital labour platforms institutionalisation / **199**

Jakub Sukiennik, Sławomir Czetwertyński

The Concept of Autogenic Institutional Change in the Light of the Activities of the Constitutional Tribunal / **215**

Anna Mercik

Leisure Mobility Among Young Urban Residents: A Case Study of the GZM Metropolis / **241**

Joanna Kudelko, Monika Musiał-Malago'

Revenue of municipalities located in protected areas and their tourism potential / **261**

Yanina Dymitrowska

Natural Resource Funds and Their Stabilization Function: Methodological-Empirical Foundations / **289**

Magdalena Byczkowska

The evolution of economic models in the context of global change: the transition to a green economy as a means of achieving sustainable development / **315**



The innovation of enterprises and cooperation between science and business in the didactic aspect

MAREK TOMASZEWSKI

corresponding author

Institute of Economics and Finance, Faculty of Legal and Economic Sciences,
University of Zielona Góra, Podgórna 50, 65-246 Zielona Góra

✉ m.tomaszewski@wez.uz.zgora.pl

 ORCID: 0000-0003-2590-5159

GABRIELA TOMASZEWSKA

Faculty of Law and Administration, University of Szczecin
Narutowicza 17A, 70-240 Szczecin

✉ gabrysiatomaszewska2@gmail.com

Abstract

Motivation: Key variables influencing enterprise innovation often include size, revenue dynamics, and technological class. Research also highlights the role of supply chain relations and geographic distance. However, there is a lack of studies addressing the impact of science–business cooperation in didactic and practical aspects on innovative activity.

Aim: This article examines whether such cooperation stimulates innovation in industrial enterprises and compares its influence with other established determinants.

Methods: The study applied logit modelling to analyze collected data and determine the direction and strength of selected independent variables' impact on innovation-related dependent variables.

Results and Added Value: Findings indicate that cooperation between science and business contributes positively to innovation. Specifically, product innovation was supported by professional internships for students and academic staff within enterprises, as well as company-organized meetings and presentations facilitating knowledge transfer. In contrast, barriers to product innovation included entrepreneurs' low evaluation of academic staff competencies and the ineffectiveness of certain knowledge transfer mechanisms.

Regarding process innovation, study visits by students and lecturers to enterprises, combined with effective transfer mechanisms, played a significant stimulating role.

The study concludes that didactic and practical cooperation between science and business effectively supports both product and process innovations. Its impact is comparable to that of knowledge transfer methods and enterprise ownership forms typically associated with high innovative capacity. This represents the key added value of the research, emphasizing the relevance of structured collaboration in shaping enterprise innovation strategies.

Keywords: product innovations; process innovations; didactic-practical aspects of cooperation between science and business, logit modelling

JEL: O31; O33; O38; L14; C35

1. Introduction

The positive impact of innovation on the development of enterprises and entire economies in regional, national or global terms has long been positively verified by economists and historians. This issue has been the subject of research since the industrial revolution in the 19th century (Smith 2016, pp. 18–19). The involvement of enterprises in innovation activity has a positive impact on the improvement of their work efficiency and the increase of the wealth of countries (Kuznets, 1966, p. 75). A feedback can be observed between the innovation activity of enterprises and the level of economic development. Higher innovation activity of enterprises affects higher economic growth, while higher economic growth stimulates the innovation activity of individual enterprises. Contemporary research has identified a huge and complex set of factors specific to individual enterprises, sectors or entire national economies (Yildiz, Murtic, Klofsten & Richtnér 2021, pp. 102–130; Mendoza-Silva 2021, pp. 707–734; Costa Cavalcante, 2024, pp. 60–76.). The literature review showed that the innovation activity of enterprises is influenced by numerous variables, which include, for example: enterprise size, market conditions, technological class, links in supply networks, available sources of financing, enterprise location and many other variables.

A separate research area widely described in the literature is the issue of cooperation between the spheres of science and business, whether in isolation from other conditions or within the triple or quadruple helix.

While university–business cooperation has been extensively studied in the context of technology transfer, commercialization, and R&D collaboration, a parallel stream of research has also examined education-driven cooperation, including work-integrated learning, student mobility, and curriculum co-creation.

However, despite this growing body of literature, relatively little quantitative evidence exists at the firm level on how such educational and practice-oriented forms of cooperation translate into innovation outcomes, particularly in industrial enterprises operating in catching-up economies.

Therefore, the contribution of this article lies not in identifying an entirely unexplored field, but in providing firm-level empirical evidence on the relationship between didactic–practical university–business cooperation and product and process innovation in the specific regional context of Poland.

The article consists of six parts: introduction, literature review, methodological aspects of the conducted research, results, discussion, and conclusions.

The literature review presents an overview of the conditions influencing the innovative activity of industrial enterprises, as described in the literature. The issue of cooperation between enterprises and research institutions is addressed as well.

The methodological aspects of the conducted research describe the procedure for determining the number and structure of enterprises selected for the study. Furthermore, the research method that allowed for drawing conclusions is characterized and the dependent and independent variables included in the study are listed.

The next section presents the obtained results regarding the conditions for new product and process innovations.

The “Discussion” section compares the obtained conclusions with those published in other authors’ works.

The final section presents the conclusions drawn from the article, its limitations, and areas that deserve further development in future publications.

To summarize this introduction, it should be emphasized that the impact of collaboration between industrial enterprises and universities on innovative activity in both the educational and practical aspects is an extremely important issue and one often overlooked in the literature. Demonstrating a positive relationship between these variables could translate into greater attention to issues related to collaboration between both entrepreneurs and university staff, which is still not very common in Poland.

2. Literature review

2.1. Determinants of innovative activity

The issue of determinants of innovation activity of enterprises has already been discussed quite widely in the literature on the subject. Individual studies described in the publications differed in terms of taking into account different dependent and independent variables, as well as the geographical area in which the study was conducted. For example, Bhattacharya and Bloch (2004, pp. 155–162) examined how enterprise size, market structure, profitability, enterprise revenues and R&D activity influenced product innovations in small and medium-sized enterprises located in Australia. This study also took into account technological classes divided into low and high technologies. Similar studies were also conducted by De Jong and Vermeulen (2006, pp. 587–609) among small enterprises located in the Netherlands.

Love and Roper (1999, pp. 43–64) showed that R&D activity, technology transfer and the creation of network connections as substitutes for each other, and do not mutually support innovative activity. They also noted that the strengthening of a monopoly in a sector does not favor the innovative activity of enterprises, and the increase of the size of the enterprise has a positive effect on the creation of network connections by these entities. However, these authors did not notice the relationship between the size of the enterprise and R&D activity and technology transfer.

Determinants of innovation activity among Japanese technology-based start-ups were analyzed by Lynskey (2004, pp. 169–196). He showed that the number of patents and new product implementations depend on the availability of the company's own funds and venture capital funds, as well as the links between the science and business spheres. The author also included in the study the influence of CEO characteristics, such as education and the ability to establish contacts with employees from the science sphere, on selected dependent variables.

Aspects related to the influence of networks, distribution and internal R&D on product and process innovations were drawn to by Capitano, Coppola and Pascucci (2010, pp. 503–518). Their study was conducted among Italian companies producing food products. A similar study among small companies was conducted by Frey, Iraldo and Testa (2013, pp. 352–364).

Interesting conclusions also result from the work of Prokop and Stejskal (2019, pp. 134–46), who showed that the determinants influencing product and process innovations differ depending on the size of the enterprise. They suggest that small enterprises should focus primarily on internal R&D, while medium-sized enterprises should focus on acquiring knowledge through

training. The role of training in supporting innovative activities, divided into product, process, organizational and marketing innovations, was also indicated in their work by Carvalho, Costa and Caiado (2013, pp. 583–600).

Also noteworthy is the work of Divisekera and Nguyen (2018, pp. 157–167), who examined the conditions influencing the occurrence of service and marketing innovations in the tourism services sector. In the case of these types of innovation, two groups of factors played the most important role. The first group was related to the expenditures incurred on: establishing cooperation, improving the quality of available human capital and acquiring new information technologies. The second group of factors included: foreign ownership of the enterprise, the strength of the impact of competition, the size of the enterprise and the environment in which the enterprise operates. The determinants of the innovative activity of service enterprises were also studied by Jose Madeira Silva, Simoes, Sousa, Moreira, Wagner Mainardes (2014, pp. 404–416) and Hue (2019, pp. 247–267).

The role of socio-cultural and demographic conditions in stimulating innovative activity was pointed out by Grego-Planer and Kuś (2020, pp. 137–148). These relationships were also dealt with in their works by Munjal and Kundu (2017, pp. 1–11).

The specificity of conditions influencing the implementation of innovative activities of Polish enterprises was studied, among others, by Sudolska and Łapińska (2020, pp. 1–20), Sachpazidu-Wójcicka, (2017, pp. 287–299) and Świadek and Gorączkowska (2020, pp. 811–831).

2.2. Cooperation between entities from the sphere of science and business

The issue of cooperation between universities and businesses first appeared in the literature as a subject of scientific interest in 1995 and has been continuously developed since then. Issues discussed within this framework include: technology transfer and the ability of enterprises to absorb knowledge acquired from universities, the diffusion of cooperative links between science and business in regions, and the impact of cooperation between enterprises and universities on the financial results of enterprises (Mascarenhas, Ferreira & Marques, 2018, pp. 708–718). Cooperation between science and business is also analyzed from the perspective of regional or national innovation systems, the triple or quadruple helix, and in the context of the entrepreneurial university (Pereira, Franco, 2023, pp. 676–690).

Cooperation between universities and businesses is an important factor in regional development. However, despite numerous support programs implemented by public administration, such interactions between businesses and universities are extremely weak, especially in developing countries (Şerbanica, 2011, pp. 29–44; Merritt, 2015, pp. 568–588).

This is primarily due to two reasons: first, universities carry out scientific research inspired by the interests of scientists, that are not necessarily related to the needs of enterprises, and second, most enterprises do not have the research and development potential to engage in talks with scientists on a partnership level. Other barriers hindering cooperation between enterprises and universities include: 1) lack of knowledge among entrepreneurs about the research areas carried out by university researchers and insufficient information about university programs that can support cooperation between universities and business entities (Pereira, Franco, 2022, pp. 37–50); 2) low scientific potential of universities, especially those located in underdeveloped regions (Cui, Li, 2022, pp. 915–930). Furthermore, research has shown that even when scientists do not perceive any barriers limiting cooperation with enterprises, such cooperation will still not occur unless factors stimulating it appear (Galán-Muros, Plewa, 2016, pp. 369–382).

The issue of institutional barriers limiting effective university–industry cooperation has been examined in recent studies, including those by Khachatryan, Hakobjanyan, Nikoghosyan, and Keryan (2024), which point to weak institutional capacity and limited engagement of firms in collaborative activities. These constraints are particularly evident in the educational dimension of cooperation, where insufficient alignment between academic curricula and firms' needs, as well as limited involvement of enterprises in curriculum co-development, reduce the effectiveness of joint training initiatives.

Cooperation between universities and enterprises in both the didactic and practical dimensions is currently one of the key challenges in the process of orienting higher education to the needs of the labor market (Pavlin, 2016, pp. 25–39). Its important element is defining the role of entrepreneurs in shaping the competences of graduates and setting directions for the development of academic teaching in the perspective of practical education.

In this context, work-integrated learning (WIL) should be a fundamental area of cooperation between academia and business. Its importance stems from the fact that it provides graduates with the necessary industry experience for the successful implementation of innovations (Rampersad, 2015, pp. 203–227).

WIL partnerships pose many challenges in practical application. These difficulties stem from the need to redistribute knowledge–power relations between the university and the host organization. Research (Choy & Delahaye, 2011, pp. 157–172) indicates that effective work-integrated learning, which addresses both the needs of individuals and workplaces, relies on learning partnerships where curricular and pedagogical roles are genuinely shared. The fact that such partnerships are integral to effective work-integrated learning, while also being highly problematic, justifies the need for further research into the dynamics and mechanisms of university–organization collaborations.

Recent studies have further systematized education-driven university–business cooperation, emphasizing its role in student mobility, curriculum development, and lifelong learning (Orazbayeva et al., 2020). Moreover, Zhang et al. (2022) highlight the importance of cognitive and institutional drivers shaping faculty engagement in such cooperation.

Complementary evidence suggests that university–industry collaboration contributes not only to improved innovation performance but also to the development of firm-level human capital and organizational capabilities (Liu, 2025).

3. Methods

Data were collected using a standardized questionnaire administered through direct contact with enterprises. The questionnaire consisted primarily of closed-ended questions, allowing for binary coding of variables.

The respondents were typically individuals responsible for managerial or operational decision-making within the firm (e.g., owners, managers, or department heads), ensuring adequate knowledge of innovation activities and cooperation practices.

According to data from the Central Statistical Office, there were 36,456 industrial enterprises operating in the Lubuskie and Lower Silesian Regions in 2022. Based on commonly available research sample selection calculators, it was determined that assuming a maximum error of 5%, a confidence level of 95% and a fraction size of 0.5, the minimum research sample should be 380 units.

Knowing the size of the research sample, its structure was then determined. For this purpose, two stratification criteria were adopted: location (Lubuskie and Dolnośląskie Regions) and company size (micro, small, medium and large). Data necessary to determine the key for structuring the research sample were obtained from the website of the Local Data Bank of the Central Statistical Office. This key is presented in Table 1.

After multiplying the data from the table above by the size of the research sample (380 enterprises), the structure of the entire research sample was established and is presented in the Table 2.

In order to collect the required number of survey questionnaires, in accordance with the structure presented above, an address database of all enterprises classified in section C of PKD 2007 was purchased from the Central Statistical Office. In addition to contact/address data, this database contained information on the number of employees and the location of the enterprise. This information allowed for the classification of enterprises into one of eight groups according to Table 2. Next, enterprises were randomly selected for the survey within each of these groups.

The collection of survey questionnaires took place at the turn of 2022–2023, while the period for which the data was collected was 2019–2021. The study was carried out by employees of the Department of Innovation and Entrepreneurship at the University of Zielona Góra in cooperation with students attending their classes. In order to verify the reliability of the surveys collected by students, the employees of the department conducted interviews verifying the authenticity of the submitted surveys. The inclusion of students in the research process is suggested by Lundvall (2007, pp. 95–119), who draws attention to the difficulties in financing scientific research in developing countries. Behrens and Gray (2001, 179–199) and Baldini (2008, pp. 289–311) also wrote about the role of students and the benefits they gain from participating in scientific research.

The response rate in the study was 2%. While relatively low, this level is not un-common in firm-level surveys, particularly those addressed to enterprises and involving detailed questionnaires. With regard to missing data, questionnaires that were returned incomplete were excluded from the analysis.

Prior to the main data collection, the questionnaire was pilot-tested on a small group of firms to ensure clarity and consistency.

Ethical standards were maintained throughout the research process. Participation of students in data collection was voluntary and supervised by academic staff. All respondents were informed about the purpose of the study and assured of anonymity and confidentiality. No sensitive firm-level data allowing identification were disclosed.

The dependent and independent variables adopted in the study were binary (0 and 1). The dependent variables included the occurrence of product and process innovations that were new at least on the scale of the enterprise. Kafetzopoulos and Psomas (2015, pp. 104–130) point out that both types of innovations should be examined together, which is the case in this article. The occurrence of such innovations was marked with the value 1. The absence of such innovations in the studied enterprises was marked with the value 0. The independent variables were marked in a similar way.

In the case of independent variables, the selection of variables for modeling was based on a literature review and the guidelines included in the Oslo Manual (OECD, 2018). These variables were divided into six groups. The first group concerned the sources of financing for the innovation project, which included: existing internal capital of the enterprise, co-financing from regional public funds, co-financing from national public funds, co-financing from EU funds, bank loans and other sources. The second group concerned tax reliefs related to R&D activities and operational activities. The third group of independent variables included the types of entities with which industrial enterprises could cooperate, i.e.: suppliers, competitors, recipients, Polish Academy of Sciences units, universities, domestic and foreign research and development units and other entities operating within

one capital group. The fourth group of variables included aspects related to cooperation with universities, but in the didactic and practical area. This group of variables included the fact of a study visit of students, internships of students and academic staff, professional internships and conducting classes by entrepreneurs with students.

The fifth group of independent variables concerned knowledge transfer mechanisms occurring in the cooperation process. These mechanisms included exchange, informal channels, formal employee meetings and presentations, joint courses, and delivery of a finished product, prototype, or technical documentation.

The last group of variables concerned barriers that made it difficult or even impossible to establish cooperation. It included the following variables: lack of need for technical changes on the part of enterprises, lack of financial resources, insufficient competences of enterprise employees, insufficient competences of academic employees, lack of knowledge of the university's offer, insufficient public support, too strong bureaucracy and fear of losing the secret related to the technical aspects of the product or process that is the subject of cooperation.

In the study, the following control variables were adopted: enterprise size divided into small, medium and large enterprises; the form of enterprise ownership divided into ownership: domestic, foreign and mixed; sales range divided into local, regional, national and international; technological class of the enterprise divided into: low, medium-low, medium-high and high technologies.

The computational part of the study was based on logit modeling. The choice of this method resulted from the binary form of the variables adopted for the study. As a consequence of conducting logit modeling, the odds ratios were determined, which provided information about the probability of occurrence of the dependent variable. Assuming a value greater than one for the odds ratios meant that the probability of the expected event occurring with a given independent variable was higher than the probability of this event occurring with the remaining independent variables included in the same group of variables. In the case of accepting a value less than 1 for the odds ratio, the interpretation of probability is reversed.

Statistica 13 software (TIBCO Software Inc., Palo Alto, CA, USA, 2017) has been used for analysis. It should be emphasized that not all variables included in the study met the condition of statistical significance. The variables that were used in the estimation process in the model are presented in Table 3.

The formal form of the equations for the models presented later in this paper is presented below:

$$\begin{aligned} Int_nprod = & \alpha_0 + \alpha_1 Dom_cap_i + \alpha_2 Reg_Sale_i + \alpha_3 BC_i + \alpha_4 Stud_app_i + \\ & \alpha_5 meet_pres_i + \alpha_6 com_cour_i + \alpha_7 del_fin_prod_i + \alpha_8 Unf_Op_Aca_i + \alpha_9 LP_supp_i \\ & + \alpha_{10} Low_tech_i + u_i, \quad (1) \end{aligned}$$

$$Int_nproc = \alpha_0 + \alpha_1 Mix_cap_i + \alpha_2 For_cap_i + \alpha_3 Mainly_EA_i + \alpha_4 Study_visit_i + \alpha_5 meet_pres_i + \alpha_6 han_doc_i + \alpha_7 del_fin_prod_i + \alpha_8 Loss_TS_i + u_i, (2)$$

In the context of the literature review conducted above, the research hypothesis was formulated as follows:

H0: Innovation-active enterprises are more open to the environment and relatively more often cooperate with universities in the didactic and practical aspects.

To verify the main hypothesis, partial hypotheses were also formulated:

H1: *Cooperation between the sphere of science in the didactic and practical aspect and the sphere of business has a positive impact on the innovative activity of enterprises in the area of new product and process innovations*

H2: *The impact of cooperation in the didactic and practical aspect is comparable to the impact of traditional knowledge transfer mechanisms and other key determinants of innovation activity of enterprises.*

H3: *Not every knowledge transfer mechanism stimulates the innovation activity of enterprises.*

H4: *Not all barriers to cooperation in the field of innovation included in the study turn out to be factors that destimulate innovation activity.*

The selection of the Lower Silesian and Lubuskie regions was intentional. These regions differ in terms of economic development, industrial structure, and innovation potential, while at the same time remaining geographically proximate. Lower Silesia represents a more industrialized and innovation-active region, whereas Lubuskie is characterized by a smaller industrial base and lower innovation intensity. This contrast allows for capturing variability in cooperation patterns and innovation behavior within a relatively homogeneous national context.

4. Results

4.1. Product innovations

The models (1) and (2) explaining the conditions influencing the implementation of new products and processes in Polish industrial enterprises from the Lower Silesian and Lubuskie Regions are presented in Tables 4 and 5.

When analyzing the obtained results, it is worth noting that the above model does not contain variables that, despite being included in the estimation process, were rejected in the further research process as statistics insignificant. These variables include, among others, control variables regarding the size of the enterprise and the fact of cooperation in the field of innovation with various partners from the sphere of science and business. The absence of these variables means that for cooperating enterprises neither the size of the enterprise nor cooperation with a specific group of partners are important when implementing a completely new product into production.

The first group of factors, which was identified as having a significant impact on the implementation of new products, concerned knowledge transfer mechanisms. Within this group, the dependent variable is positively influenced by the delivery of a finished product to the contractor and joint meetings and presentations. The chance of implementing new products into production in the first case increased 2.17-fold, and in the second 1.56-fold.

In turn, the organization of joint courses and training by the company in cooperation with external partners contributed to a 39% reduction in the chances of implementing new products.

Credit activity carried out by the banking sector also has a stimulating effect on the introduction of new products into production by enterprises. When enterprises use this type of financing, then the chances of introducing a new product into production increase more than twice.

Student/professional internships, which are carried out at industrial enterprises, also have a positive effect on the dependent variable. In such a situation, the chances of implementing a new product into production increase by 57%. The reasons for this state of affairs may be different. On the one hand, it should be remembered that the participants of the internships are pupils or students, i.e. young people who approach the problems posed in an unconventional way, which results from their creativity or sometimes from a lack of appropriate knowledge. The questions they ask force entrepreneurs to redefine the problem, which can lead to interesting and constructive conclusions. On the other hand, the implementation of professional and student internships in an enterprise is a manifestation of more or less formalized cooperation between an entity from the business sphere and the science sphere. The more areas this cooperation covers, the greater the chances of product innovations. More frequent contact between enterprises and educational and scientific units translates into easier transfer of knowledge from the science sphere to the business sphere. It should also be remembered that after completing their education, young graduates can find employment in companies where they completed their internships, thus facilitating the transfer of knowledge to the sphere of science and business. Such a transfer of knowledge is particularly valuable in the case of graduates of technical and engineering faculties.

Interesting conclusions can be drawn based on the analysis of another determinant, which is the barrier of “low support from public administration for innovative activity of enterprises”. The obtained odds ratio of 1.67 means that the chances of implementing product innovations in enterprises that believe that support from public administration for this type of activity is too low are 67% higher than in enterprises that have a different opinion on this subject. This means that this opinion does not constitute a real barrier for enterprises and despite the fact that they express the above opinion, they still carry out work related to the implementation of new products into produc-

tion. The situation indicates the weakness of the Polish system of supporting enterprises in implementing innovative solutions and the bad opinion of this system among entrepreneurs.

The conducted research also showed that the implementation of product innovations by industrial enterprises was stimulated by the implementation of activities based on low technologies. The probability of implementing new products into production in this group of enterprises is 35% higher than in enterprises using higher technologies in their basic activity. This relationship is characteristic of developing countries, in which sectors related to low technologies dominate (e.g. food, furniture or construction materials industry) and medium-low technologies (e.g. production of rubber and plastic products, production from other non-metallic raw materials, production of metals and finished metal products). In such conditions, implementing a new product into production is relatively simple, due to the specificity of this type of products.

Among the factors that constitute a barrier to implementing product innovations, false perceptions and stereotypes about the academic staff of Polish universities should be mentioned first. The probability of product innovations in the group of entrepreneurs who presented such views was 72% lower than the probability of product innovations in the group of entrepreneurs who did not share such an opinion.

Another barrier to implementing new product innovations turned out to be the regional sales range. The chances of product innovations occurring in the group of enterprises characterized by such a sales range were 46% lower than in enterprises with a larger range. With such a sales range, enterprises are not very interested in new technologies, which results in lower chances of implementing them. The spatial scope of enterprises' activities limited to the level of the region indicates that the industrial enterprises studied rarely engage in modern activities and mainly implement a survival strategy.

The last factor that had a destimulating effect on the implementation of new products was the fully domestic form of ownership of the enterprise. In this group of enterprises, the chances of implementing new products into production were 43% lower than the chances of implementing new products in enterprises with a greater or lesser share of foreign capital.

4.2. Process innovations

The determinants of the introduction of new processes in enterprises identified during the study are presented in the Table 5.

Based on the parameters presented in Table 5, it can be stated that the most important factor in implementing process innovations is the form of enterprise ownership. The chances of process innovations occurring in the group of enterprises with mixed and fully foreign forms of ownership are

90% and 68% higher, respectively, than in enterprises with other forms of ownership.

Factors related to knowledge transfer mechanisms, such as the transfer of technical documentation related to manufacturing methods, delivery of the finished product, and meetings and presentations, also have a comparable impact on process innovations. The chances of implementing new processes in companies that used the above-mentioned knowledge transfer mechanisms were 77, 60, and 50% higher, respectively, than the chances of implementing new processes in companies that used other knowledge transfer mechanisms. The results obtained indicate that only extensive cooperation between the parties and mutual goodwill will facilitate the implementation of new processes. Other knowledge transfer mechanisms, such as informal channels, joint courses, and employee exchanges, turned out to be insufficient to support process innovations.

Study visits by students and lecturers also stimulate the implementation of new processes in companies. This determinant increases the chances of implementing process innovations by as much as 62% compared to entities that do not organize such visits.

Contacts with average educational institutions can also affect the innovativeness of enterprises. This results from the need for entrepreneurs to seek new impulses also from weak and unknown networks. Innovative learning is about balancing the chaos of new ideas with traditional views and experience. The ability to combine new solutions with traditional knowledge is a basic competence of innovative entrepreneurship.

Another factor stimulating the implementation of process innovations was the barrier hindering the establishment of cooperation, namely the fear of losing business secrets. The chances of implementing process innovations in companies that feel such fear are 62% higher than in companies that do not have such fears. The reasons for such a relationship may be of two types. First, companies that are known by such fears have reasons for it, i.e. they have unique knowledge related to contractors or technologies. In such a case, this fear is a consequence of the recent implementation of a process innovation. The second reason for the occurrence of the relationship in question may be related to an attempt to escape forward. Companies fear that their technological secrets will be discovered, which is why they are looking for even newer solutions, i.e. working on further process innovations.

Of the factors included in the model, only one turned out to be a real barrier that hindered the implementation of process innovations – dominant share of export activity in sales. With such a sales reach, the chances of implementing process innovations were 61% lower than in the case of companies with a smaller sales reach.

5. Discussion

Comparing the results obtained with the results presented in the literature, it should be mentioned first that the variables concerning the size of the enterprise and the fact of cooperation in the field of innovation with various partners from the sphere of science and business did not show statistical significance. In this respect, the results obtained are consistent with the results of the study conducted by Goedhuys and Veugelers (2012, pp. 516–529), Sanchez et al. (2013, pp. 339–349), Love and Roper (1999, pp. 43–64) and Oerlemans and Pretorius (2006, pp. 589–593). However, they do not coincide with the views presented by Schumpeter (1950, pp. 108–109), Bachmann, Kataichi (2025) who believed that the size of the enterprise affects innovation activity.

In the case of variables concerning knowledge transfer mechanisms, their impact on the implementation of new products was not the same. The implementation of new products was stimulated by delivering a finished product to the contractor and joint meetings and presentations. The results obtained were consistent with the views presented in the works of Rahmouni (2013, pp. 914–930) and El Elj (2012, pp. 183–197) on the implementation of product innovations. On the other hand, the implementation of new products was negatively influenced by the organization of joint courses and trainings by the company in cooperation with external partners. This issue was raised in his research by Becker (1964, pp. 299–320), who established that companies invest in training and courses only when they can gain direct benefits from training an employee. In this approach, training and courses can be treated as a consequence of product and process innovations, not their cause.

The conducted research also showed that the implementation of new products into production was positively influenced by co-financing of this activity by means of bank loans. Recent empirical studies confirm the strong and positive role of external financing in supporting firms' innovation activity. In particular, access to bank credit alleviates financial constraints, enabling firms to undertake risky and capital-intensive innovation projects. Evidence suggests that firms with better access to credit are more likely to introduce product innovations and invest in R&D activities, as external financing reduces liquidity constraints and facilitates the commercialization of new products (Prystrom, Wierzbicka 2015, p. 65; Nikolova, Rodionov, Mottaeva 2016, pp. 246–252).

Student/professional internships, which are carried out in economic entities, also have a positive impact on the dependent variable. In the literature on the subject, there are references according to which this relationship is the result of an unconventional and creative approach to new topics and issues by students and pupils (Doroshenko, Shutenko, Shutenko, Ospishchev 2016, pp. 909–914). It should also be remembered that these internships

are a manifestation of more or less formalized cooperation between the enterprise and the university. The more often this cooperation occurs, and its area becomes more diverse, the more chances for knowledge transfer between these entities increase. A similar tone was expressed in the works of Romanovich, Sevostyanov, Romanovich, Sevostyanov (2014, pp. 273–276), Bozeman and Boardman (2013, pp. 88–120) and Terkan (2014, pp. 239–246).

The results concerning the positive impact of internships and study visits suggest that policy instruments supporting education-driven university–industry cooperation may be particularly effective in strengthening firms' innovation capacity. Unlike traditional instruments focused on R&D subsidies, these forms of cooperation contribute to the development of practical skills, improve knowledge absorption capacity, and facilitate the alignment between educational outcomes and labor market needs.

Therefore, the findings of this study imply that innovation policy should place greater emphasis on supporting structured forms of didactic cooperation between universities and firms, including dual education models, internship programs, and joint curriculum development initiatives. Strengthening these instruments may enhance not only human capital formation but also the overall effectiveness of the innovation system.

At the same time, the results indicate that the mere availability of policy instruments is not sufficient. Their effectiveness depends on institutional quality, coordination mechanisms, and the degree of engagement of both firms and academic institutions. This suggests that improving the institutional framework of cooperation may be as important as increasing the scale of financial support.

When reviewing the results obtained, the positive relationship between the implementation of a new product into production and a factor that seemed to be a barrier to stimulating innovative activity deserves special attention. This factor is low public support for the innovative activity of enterprises. The positive relationship between these variables means that the surveyed enterprises, despite complaining about poor support from public administration, still carry out this type of activity.

From the perspective of innovation policy, the obtained results should be interpreted in a broader institutional context rather than solely as firm-level behavioral patterns. In particular, the positive relationship between innovation activity and the perception of insufficient public support may reflect structural weaknesses in the design and implementation of innovation policy instruments in Poland (Wojnicka-Sycz, Sycz, 2016, pp. 1–23).

Existing studies and policy reports indicate that the Polish innovation system is characterized not only by limited effectiveness of direct financial support instruments, but also by relatively weak linkages between universities and industry, especially in the area of human capital development and practical education. In this context, firms may rely more heavily on internal

capabilities and informal cooperation mechanisms, while simultaneously expressing dissatisfaction with public support systems. This conclusion is in line with the views presented in the works by Janiszewska and Janiszewski (2020, pp. 51–73) and Łukaszewska (2018, pp. 181–197).

The weakness of the Polish innovation system is evidenced by another variable related to the implementation of low-tech activities by enterprises. This relationship is characteristic of developing countries, where sectors related to low and medium-low technologies dominate. In this type of economy, implementing a new product into production is relatively simple, due to the specificity of this type of product. The issue of innovativeness of enterprises in countries dominated by low-tech economies was analyzed by, among others, Aboal and Garda (2016, pp. 435–454) and Crespi and Zuniga (2012, pp. 273–290).

Among the factors that constitute a barrier to implementing product innovations, false ideas and stereotypes about the academic staff of Polish universities should be mentioned first. The issue of prejudices and stereotypes on the part of entrepreneurs about the staff employed at Polish universities was described, among others, in studies prepared by the Ministry of Science and Higher Education (MNiSzW, 2006, p. 3), Bąk and Kulawczyk (2009, p. 20), the Western Institute (2012, p. 25) and Kuna-Marszałek and Lisowska, (2013, p. 34). The issue of the communication gap between science and business was addressed, among others, by Klevatorick, Levin, et al. (1995, pp. 185–205) and Hellman (2007, pp. 624–647).

Another identified barrier that hindered the implementation of new product innovations was the regional sales range. The obtained results were consistent with the conclusions presented in the works of Capitano, Coppola and Pascucci (2010, pp. 503–518), Świadek (2018, pp. 725–740) and Grilitsch, Tavasassoli, Obschonka (2026).

The last factor considered in the study, which had a destimulating effect on the implementation of new products into production, was the fully domestic form of ownership of the enterprise. In Polish conditions, this group of enterprises was only slightly interested in implementing new products into production. This is a serious problem from a systemic perspective. The result obtained means that among enterprises from the Lower Silesian and Lubuskie Regions, a necessary condition for implementing new products into production is having foreign capital in their structure. The obtained results are confirmed by studies included in the works of Świadek (2012, pp. 5–23) and El Elj (2012, pp. 183–197).

Based on the research conducted, it could be observed that in the case of implementing process innovations, the most important factor was the form of enterprise ownership. In the case of this type of innovation, the results obtained are consistent with the views presented in the works of, among others, Świadek (2012, pp. 5–23) and Jaklic, Damijan, Rojec (2008, pp. 1–18).

The conducted research showed that factors related to knowledge transfer mechanisms, such as the transfer of technical documentation related to manufacturing methods, delivery of the finished product, and meetings and presentations, had an equally intensive impact on process innovations. The issue of the impact of knowledge transfer mechanisms on innovations was described, among others, by: Malik and Bergfeld (2015, pp. 1129–1142), Rambe and Kahaol (2022, pp. 741–773) and Cinar, Altuntas and Alan (2021, pp. 2179–2207).

The study confirmed that study visits by students and lecturers increased the chances of implementing process innovations. This means that combining educational activities with business practice strengthens the competitive position of enterprises and allows enterprises to enter the open innovation system (Choi, Markham 2019, pp. 1–15). The ability of current and future employees to learn and improve their qualifications is particularly important for entities operating in technologically advanced sectors. This is even more important if innovation is approached as an informal learning process. Employees or future employees learn by sharing knowledge within work teams, and employers learn to create networks of collaborators and advisors (Cofré-Bravo, Klerkx & Engler 2019, pp. 53–64). The ability to combine new applications with traditional knowledge is the basis for innovative entrepreneurship (Gielen, Hoeve & Nieuwenhuis 2003, pp. 90–106).

Of course, we cannot forget about the fact that the relationship between enterprises and educational institutions is feedback. Cooperation with enterprises influences the adaptation of the offer of schools and universities to the requirements of the labor market, which in the long term translates into further benefits for enterprises in the form of the possibility of acquiring better educated employees (Pocol, Stanca, et al. 2022, pp. 1–12). Contacts with average educational institutions can also affect the innovativeness of enterprises. This results from the need for entrepreneurs to search for new impulses also from weak and unknown networks. Innovative learning is about balancing the chaos of new ideas with traditional views and experience. The ability to combine new solutions with traditional knowledge is a basic competence of innovative entrepreneurship.

Among the factors included in the model, only the variable “dominant share of export activity in sales” turned out to be a destimulating determinant. This may indicate that for companies serving mainly foreign markets, the most important thing is to have an attractive product range that will be of interest to foreign contractors. Due to the competitive advantage of Polish companies resulting from lower production costs related to cheaper labor, searching for other ways to optimize production processes, i.e. implementing process innovations, is less popular. A similar relationship was identified in the work of El Elj (2012, pp. 183–197).

6. Conclusions

The innovative activity of industrial enterprises depends on many factors. Different conditions determine the implementation of product and process innovations. The only common element concerns the mechanisms of knowledge transfer, in particular the delivery of a finished product to the cooperator and the organization of joint presentation meetings.

A common feature of implementing product and process innovations was also the positive impact of cooperation with schools in the didactic and practical field. Implementing professional internships or study visits of pupils, students and teachers in enterprises clearly contributed to increasing the probability of innovations occurring in these entities. This conclusion positively verifies the adopted main research hypothesis and the first and second auxiliary hypotheses. It should be emphasized that this thread is currently quite rarely discussed in contemporary literature on the subject.

Recent research (e.g., Costa Cavalcante, 2024) confirms that non-technological factors, including human capital development and institutional quality, play a growing role in shaping innovation performance, which is consistent with the findings of this study.

This study contributes to the existing stream of research on education-driven university–business cooperation by providing firm-level evidence from a catching-up economy. Rather than filling a completely unexplored gap, it extends previous research by linking educational forms of cooperation with measurable innovation outcomes in industrial enterprises.

An unusual relationship turned out to be the stimulating influence on innovation activity of factors that were supposed to constitute a barrier to innovation activity. We are talking here about factors related to too low public support and fears of losing trade secrets. In the case of the first relationship, it can be stated that the current system of support for innovation activity by the Polish public administration is unsatisfactory for entrepreneurs.

The paradoxical finding that firms reporting insufficient public support are more likely to innovate should be interpreted in the broader context of the Polish innovation system. Previous reports (e.g., OECD) have consistently pointed to structural weaknesses, including limited effectiveness of public support instruments and weak science–business linkages. In this context, the observed relationship may reflect a compensatory behavior of firms that rely more on internal capabilities and informal cooperation mechanisms. In the case of the second relationship, it turns out that enterprises choose the strategy of escaping forward. This means that entrepreneurs, fearing that as a result of cooperation they will lose exclusivity on the use of certain technological solutions, implement new process innovations. They do not share these latest innovations with partners with whom they have cooperated so

far. Thanks to this, they still maintain a technological advantage over other market participants, including previous cooperators. This conclusion constitutes a positive verification of the fourth auxiliary hypothesis.

The actual barriers that made it difficult to implement product and process innovations can be divided into two groups: obvious and non-obvious barriers. Obvious barriers include the national ownership of the company and the regional sales range. These variables have been described quite often in the literature on the subject. Another obvious barrier is the variable concerning the unfavorable opinion about academics among entrepreneurs. The negative perception of academic staff competencies among entrepreneurs may stem from several factors, including a mismatch between academic curricula and market needs, as well as limited practical experience of university staff. This suggests that strengthening practice-oriented education and increasing staff engagement in industry projects could help reduce this barrier. This issue would require in-depth research in the future, especially in an international context.

Less obvious barriers that hindered the implementation of product and process innovations included: the dominant share of export activity in the company's sales and the implementation of courses and trainings together with cooperators. This last conclusion resulting from the conducted research constitutes a positive verification of the third auxiliary hypothesis.

The conducted research provided valuable information on the impact of cooperation in the didactic and practical aspect between the sphere of science and business. It confirmed that this cooperation is as important as other key determinants influencing product and process innovations. It is worth emphasizing that this cooperation has a positive impact on both types of innovation included in the study.

A significant limitation of the study is the dominance of microenterprises in the sample (340 out of 380 observations), which reflects the actual population structure but limits the possibility of conducting meaningful comparative analyses across firm size categories. Future research should consider disproportionate stratified sampling combined with analytical weighting to ensure better representation of medium and large enterprises.

This study is in line with the trend of views emphasizing the important role of the didactic and practical area of activity of universities, which nowadays seems to be omitted in the literature on the subject. Most publications focus mainly on the area of scientific activity of universities and cooperation in this area with entities from the business sphere. The thread that is omitted is that one of the goals of universities is to supply the market with highly qualified employees, thanks to whom Polish enterprises will have a chance to compete or cooperate with entities operating on a global scale.

The few studies on the issue of cooperation in the didactic and practical area of higher education institutions with business entities constitute

a premise for further analyses in this area. Areas that are particularly worth investigating in the future include, among others: determinants that favor establishing cooperation in the didactic and practical area between the science and business spheres, the role of business environment institutions in stimulating this process and the role of fiscal instruments in stimulating this type of activities.

References

- Aboal, D., & Garda, P. (2016). Technological and non-technological innovation and productivity in services vis a vis manufacturing in Uruguay. *Economics of Innovation and New Technology*, 25(5), 435–454. <https://doi.org/10.1080/10438599.2015.1073478>
- Bachmann, F., & Kataishi, R. E. (2025). Firm size and innovative performance: a meta-analysis across of 25 years of evidence. *Revista Brasileira de Inovação*, 24, e025003. <https://doi.org/10.20396/rbi.v24i00.8674493>
- Baldini, N. (2008). Negative effects of university patenting: Myths and grounded evidence. *Scientometrics*, 75(2), 289–311. <https://doi.org/10.1007/s11192-007-1865-y>
- Bąk, M. (red.) & Kulawczuk, P. (red.). (2009). Warunki skutecznej współpracy pomiędzy nauką a przedsiębiorstwami. Instytut Badań nad Demokracją i Przedsiębiorstwem Prywatnym, Warszawa.
- Behrens, T. R., & Gray, D. O. (2001). Unintended consequences of cooperative research: Impact of industry sponsorship on climate for academic freedom and other graduate student outcome. *Research Policy*, 30(2), 179–199. [https://doi.org/10.1016/S0048-7333\(99\)00112-2](https://doi.org/10.1016/S0048-7333(99)00112-2)
- Bozeman, B., & Boardman, C. (2013). Academic faculty in university research centers: Neither capitalism's slaves nor teaching fugitives. *The Journal of Higher Education*, 84(1), 88–120. <https://doi.org/10.1080/00221546.2013.11777279>
- Carvalho, L., Costa, T., & Caiado, J. (2013). Determinants of innovation in a small open economy: A multidimensional perspective. *Journal of Business Economics and Management*, 14(3), 583–600. <https://doi.org/10.3846/16111699.2012.701225>
- Choi, J. I., & Markham, S. (2019). Creating a corporate entrepreneurial ecosystem: The case of entrepreneurship education in the RTP, USA. *Journal of Open Innovation: Technology, Market, and Complexity*, 5(3), 62, 1–15. <https://doi.org/10.3390/joitmc5030062>
- Choy, S., & Delahaye, B. (2011). Partnerships between universities and workplaces: Some challenges for work-integrated learning. *Studies in Continuing Education*, 33(2), 157–172. <https://doi.org/10.1080/0158037X.2010.546079>

- Cinar, O., Altuntas, S., & Alan, M. A. (2021). Technology transfer and its impact on innovation and firm performance: Empirical evidence from Turkish export companies. *Kybernetes*, 50(7), 2179–2207. <https://doi.org/10.1108/K-12-2019-0828>
- Cofré-Bravo, G., Klerkx, L., & Engler, A. (2019). Combinations of bonding, bridging, and linking social capital for farm innovation: How farmers configure different support networks. *Journal of Rural Studies*, 69, 53–64. <https://doi.org/10.1016/j.jrurstud.2019.04.004>
- Costa Cavalcante, P. L. (2024). Innovation performance and its determinants: What does it take to succeed? *Innovation & Management Review*, 21(1), 60–76. <https://doi.org/10.1108/INMR-11-2021-0206>
- Crespi, G., & Zuniga, P. (2012). Innovation and productivity: Evidence from six Latin American countries. *World Development*, 40(2), 273–290. <https://doi.org/10.1016/j.worlddev.2011.07.010>
- Cui, Z., & Li, E. (2022). Does industry–university–research cooperation matter? An analysis of its coupling effect on regional innovation and economic development. *Chinese Geographical Science*, 32(5), 915–930. <https://doi.org/10.1007/s11769-022-1308-y>
- De Jong, J. P., & Vermeulen, P. A. (2006). Determinants of product innovation in small firms: A comparison across industries. *International Small Business Journal*, 24(6), 587–609. <https://doi.org/10.1177/0266242606069268>
- Divisekera, S., & Nguyen, V. K. (2018). Determinants of innovation in tourism evidence from Australia. *Tourism Management*, 67, 157–167. <https://doi.org/10.1016/j.tourman.2018.01.010>
- Doroshenko, Y. A., Shutenko, A. I., Shutenko, E. N., & Ospishchev, P. I. (2016). The conditions and the mechanism of students' self-realization in activity of small innovative enterprises. *International Review of Management and Marketing*, 6(4), 909–914.
- El Elj, M. (2012). Innovation in Tunisia: Empirical analysis for industrial sector. *Journal of Innovation Economics & Management*, 9(1), 183–197. <https://doi.org/10.3917/jie.009.0183>
- Frey, M., Iraldo, F., & Testa, F. (2013). The determinants of innovation in green supply chains: Evidence from an Italian sectoral study. *R&D Management*, 43(4), 352–364. <https://doi.org/10.1111/radm.12020>
- Galán-Muros, V., & Plewa, C. (2016). What drives and inhibits university-business cooperation in Europe? A comprehensive assessment. *R&D Management*, 46(2), 369–382. <https://doi.org/10.1111/radm.12180>
- Gielen, P. M., Hoeve, A., & Nieuwenhuis, L. F. (2003). Learning entrepreneurs: Learning and innovation in small companies. *European Educational Research Journal*, 2(1), 90–106. <https://doi.org/10.2304/eerj.2003.2.1.13>
- Goedhuys, M., & Veugelers, R. (2012). Innovation strategies, process and product innovations and growth: Firm-level evidence from Brazil. *Struc-*

- tural Change and Economic Dynamics*, 23(4), 516–529. <https://doi.org/10.1016/j.strueco.2011.01.004>
- Grillitsch, M., Tavassoli, S., & Obschonka, M. (2026). Unlocking firm innovation under regional disadvantage: Can psychological openness compensate? *Research Policy*, 55(5), 105463. <https://doi.org/10.1016/j.respol.2026.105463>
- Hellman, T. (2007). The role of patents for bridging the science to market gap. *Journal of Economic Behavior & Organization*, 63, 624–647.
- Hue, T. T. (2019). The determinants of innovation in Vietnamese manufacturing firms: An empirical analysis using a technology–organization–environment framework. *Eurasian Business Review*, 9(3), 247–267. <https://doi.org/10.1007/s40821-019-00125-w>
- Jaklic, A., Damijan, J. P., & Rojec, M. (2008). Innovation cooperation and innovation activity of Slovenian enterprises. LICOS Centre for Institutions and Economic Performance, Discussion Paper No. 201, 1–18. <http://dx.doi.org/10.2139/ssrn.1107204>
- Janiszewska, M., & Janiszewski, J. (2020). Wykorzystanie regulacji podatkowych w działalności innowacyjnej polskich przedsiębiorców. BAS, Warszawa.
- Jose Madeira Silva, M., Simoes, J., Sousa, G., Moreira, J., & Wagner Mainardes, E. (2014). Determinants of innovation capacity: Empirical evidence from services firms. *Innovation*, 16(3), 404–416. <https://doi.org/10.1080/14479338.2014.11081996>
- Kafetzopoulos, D., & Psomas, E. (2015). The impact of innovation capability on the performance of manufacturing companies. *Journal of Manufacturing Technology Management*, 26(1), 104–130. <https://doi.org/10.1108/JMTM-12-2012-0117>
- Khachatryan, K., Hakobjanyan, A., Nikoghosyan, K., & Keryan, T. (2024). Development of university–industry partnership in Armenia: university perspective. *Journal of International Education in Business*, 17(1), 170–192. <https://doi.org/10.1108/JIEB-07-2023-0051>
- Klevatorick, A. K., Levin, R. C., Nelson, R. R., & Winter, S. G. (1995). On the sources and significance of interindustry differences in technological opportunities. *Research Policy*, 24(2), 185–205. [https://doi.org/10.1016/0048-7333\(93\)00762-I](https://doi.org/10.1016/0048-7333(93)00762-I)
- Kuna-Marszałek, A., & Lisowska, R. (2013). Współpraca sfery nauki i przedsiębiorstw – przegląd badań. W: J. Różański (red.), *Współpraca nauki i biznesu jako czynnik wzmacniający innowacyjność regionu łódzkiego*. Wydawnictwo Biblioteka, Łódź.
- Kuznets, S. (1966). *Modern economic growth: Pattern, structure and spread*. New Haven, CT: Yale University Press.
- Liu, J. (2025). How does university–industry collaboration motivate enterprise participation and promote human resource development? *Acta Psychologica*, 260, 105686.

- Love, J. H., & Roper, S. (1999). The determinants of innovation: R & D, technology transfer and networking effects. *Review of Industrial Organization*, 15, 43–64.
- Lundvall, B. Å. (2007). National innovation systems: Analytical concept and development tool. *Industry and Innovation*, 14(1), 95–119. <https://doi.org/10.1080/13662710601130863>
- Lynskey, M. J. (2004). Determinants of innovative activity in Japanese technology-based start-up firms. *International Small Business Journal*, 22(2), 159–196. <https://doi.org/10.1177/0266242604041312>
- Łukaszewska, K. (2018). Ulga na działalność badawczo-rozwojową jako szansa poprawy pozycji innowacyjnej polskich przedsiębiorstw. *Ruch Prawniczy, Ekonomiczny i Socjologiczny*, 80(3), 181–197.
- Malik, K., & Bergfeld, M. M. (2015). A conceptual framework for intra-company technology transfer: Cases of leveraging production process innovations across MNEs. *Technology Analysis & Strategic Management*, 27(10), 1129–1142. <https://doi.org/10.1080/09537325.2015.1060309>
- Mascarenhas, C., Ferreira, J. J., & Marques, C. (2018). University–industry cooperation: A systematic literature review and research agenda. *Science and Public Policy*, 45(5), 708–718. <https://doi.org/10.1093/scipol/scy003>
- Mendoza-Silva, A. (2021). Innovation capability: A systematic literature review. *European Journal of Innovation Management*, 24(3), 707–734. <https://doi.org/10.1108/EJIM-09-2019-0263>
- Merriitt, H. (2015). The role of human capital in university-business cooperation: The case of Mexico. *Journal of the Knowledge Economy*, 6(3), 568–588. <https://doi.org/10.1007/s13132-015-0258-3>
- Ministry of Science and Higher Education, Department of Implementation and Innovation. (2006). Barriers to cooperation between entrepreneurs and research centers. Warszawa.
- Munjal, S., & Kundu, S. (2017). Exploring the connection between human capital and innovation in the globalising world. In S. Munjal & S. Kundu (Eds.), *Human Capital and Innovation: Examining the Role of Globalization*. London: Palgrave Macmillan UK.
- Nikolova, L. V., Rodionov, D. G., & Mottaeva, A. B. (2016). Securitization of bank assets as a source of financing the innovation activity. *International Journal of Economics and Financial Issues*, 6(2), 246–252.
- Oerlemans, L. A. G., & Pretorius, M. W. (2006). Some views on determinants of innovative outcomes of South African firms: An exploratory analysis using firm-level data. *South African Journal of Science*, 102, 589–593. <https://hdl.handle.net/10520/EJC96471>.
- Orazbayeva, B., Davey, T., Plewa, C., & Galán-Muros, V. (2020). Engagement of academics in education-driven university-business cooperation: A motivation-based perspective. *Studies in Higher Education*, 45(8), 1723–1736. <https://doi.org/10.1080/03075079.2019.1582013>

- Organisation for Economic Co-operation and Development & Statistical Office of the European Communities (OECD). (2018). Oslo manual: Guidelines for collecting, reporting and using data on innovation (4th ed.).
- Pavlin, S. (2016). Considering university-business cooperation modes from the perspective of enterprises. *European Journal of Education*, 51(1), 25–39. <https://doi.org/10.1111/ejed.12163>.
- Pereira, R., & Franco, M. (2022). Cooperation between universities and SMEs: A systematic literature review. *Industry and Higher Education*, 36(1), 37–50. <https://doi.org/10.1177/0950422221995114>.
- Pereira, R., & Franco, M. (2023). University-firm cooperation and regional development: Proposal of a model of analysis. *Journal of the Knowledge Economy*, 14(2), 676–690. <https://doi.org/10.1007/s13132-022-00947-6>
- Pocol, C. B., Stanca, L., Dabija, D. C., Pop, I. D., & Mişcoiu, S. (2022). Knowledge co-creation and sustainable education in the labor market-driven university–business environment. *Frontiers in Environmental Science*, 10, 781075, 1–12. <https://doi.org/10.3389/fenvs.2022.781075>
- Prokop, V., & Stejskal, J. (2019). Determinants of innovation activities and SME absorption – Case study of Germany. *Scientific Papers of the University of Pardubice. Series D, Faculty of Economics and Administration*, 46, 134–146. <https://hdl.handle.net/10195/74243>
- Prystrom, J., & Wierzbicka, K. (2015). Finansowanie działalności innowacyjnej. Difin SA.
- Rahmouni, M. (2017). Innovativeness of exporting firms in a developing country: The case of Tunisia. *Economics Bulletin*, 33(2), 914–930. <https://ssrn.com/abstract=3060361>.
- Rambe, P., & Khaola, P. (2022). The impact of innovation on agribusiness competitiveness: The mediating role of technology transfer and productivity. *European Journal of Innovation Management*, 25(3), 741–773. <https://doi.org/10.1108/EJIM-05-2020-0180>
- Rampersad, G. C. (2015). Developing university-business cooperation through work-integrated learning. *International Journal of Technology Management*, 68(3–4), 203–227. <https://doi.org/10.1504/IJTM.2015.069664>
- Romanovich, L., Sevostyanov, V., Romanovich, M., & Sevostyanov, M. (2014). Innovation activity and technology transfer of higher education. *Journal of Applied Engineering Science*, 12(4), 273–276. <https://doi.org/10.5937/jaes12-7164>
- Sachpazidu-Wójcicka, K. (2017). Innovation as a determinant of the competitiveness of Polish enterprises. *Oeconomia Copernicana*, 8(2), 287–299. <https://doi.org/10.24136/oc.v8i2.18>
- Schumpeter, J. A. (1950). Capitalism, socialism and democracy (3rd ed.). New York: Harper and Row.

- Șerbanica, C. (2011). A cause and effect analysis of university-business cooperation for regional innovation in Romania. *Theoretical & Applied Economics*, 18(10), 29–44.
- Smith, A. (2016). The wealth of nations. Aegitas.
- Sudolska, A., & Łapińska, J. (2020). Exploring determinants of innovation capability in manufacturing companies operating in Poland. *Sustainability*, 12(17), 7101, 1–20. <https://doi.org/10.3390/su12177101>
- Świadek, A. (2012). Wielkość przedsiębiorstw i ich struktura własności a rozwój innowacyjności w regionalnych systemach przemysłowych. *Studia Regionalne i Lokalne*, 13(47), 5–23.
- Świadek, A. (2018). Sales range and innovative activity in the manufacturing system of Poland. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 13(4), 725–740. <http://dx.doi.org/10.24136/eq.2018.035>.
- Świadek, A., & Gorączkowska, J. (2020). The institutional support for an innovation cooperation in industry: The case of Poland. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 15(4), 811–831. <https://doi.org/10.24136/eq.2020.035>
- Terkan, R. (2014). Importance of creative advertising and marketing according to university students' perspective. *International Review of Management and Marketing*, 4(3), 239–246.
- Western Institute. (2012). Research on the needs of entrepreneurs from Greater Poland in terms of cooperation with the R&D sector. Western Institute, Poznań.
- Wojnicka-Sycz, E., Sycz, P. (2016). Public innovation policy and other determinants of innovativeness in Poland. *The Innovation Journal: The Public Sector Innovation Journal*, 21(3), 1–23.
- Yildiz, H. E., Murtic, A., Klofsten, M., Zander, U., & Richtnér, A. (2021). Individual and contextual determinants of innovation performance: A micro-foundations perspective. *Technovation*, 99, 102–130. <https://doi.org/10.1016/j.technovation.2020.10213>.
- Zhang, H., Chen, X., Lv, Y., & Li, M. (2022). Drivers of university–business cooperation of university faculty from the social cognitive theory perspective. *Frontiers in Psychology*, 13, 1013774. <https://doi.org/10.3389/fpsyg.2022.1013774>

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Appendix

Table 1. Key to selecting the number of industrial enterprises for the study, taking into account stratification according to their size and location

Region	Company size	Micro	small	medium	Big	Together
Lubuskie		24.61%	1.82%	0.57%	0.09%	27%
Lower Silesia		64.71%	6.08%	1.70%	0.41%	73%
Together						100%

Source: Own study based on data from the Central Statistical Office.

Table 2. Structure of the research sample

Region	Company size	Micro	Small	medium	Big	Together
Lubuskie		94	7	2	0	103
Lower Silesia		246	23	6	2	277
Together		340	30	8	2	380

Source: Own study based on data from the Central Statistical Office.

Table 3. Definitions of variables used in equations

Variables	Description
Variable dependent	
<i>Int_NProd</i> <i>Int_Nproc</i>	1: new product introduction; 0: no new product introduction; 1: new process introduced; 0: no new process introduced
Variables independent	
<i>BC</i>	<i>Sources of financing for innovative projects:</i> 1: bank loan; 0: no bank loan
<i>Study visit</i>	<i>Cooperation in the didactic and practical aspect:</i> 1: study visits of students/lecturers to enterprises; 0: no study visits of students/lecturers to enterprises
<i>Stud_app</i>	1: student internships; 0: no student internships
<i>meet_pres</i>	<i>Knowledge transfer mechanisms:</i> 1: Meetings and presentations; 0: no meetings
<i>com_court</i>	1: Joint courses; 0: no joint courses or trainings
<i>han_doc</i>	1: Documentation transferred; 0: No documentation transferred
<i>del_fin_prod</i>	1: Delivery of finished product; 0: no delivery of finished product
<i>Unf_Op_Aca</i>	<i>Barriers to establishing cooperation:</i> 1: unfavorable opinion of academic staff; 0: favorable opinion of academic staff competence of academic staff
<i>LP_supp</i>	1: Too little public support; 0: Adequate support from public administration
<i>Loss_TS</i>	1: Fear of losing company secrets; 0: No fear of losing company secrets
Variables checklist	
<i>Dom_cap</i>	<i>Form of company ownership:</i> 1: domestic form of ownership; 0: other than domestic form of ownership of enterprise
<i>For_cap</i>	1: foreign form of ownership; 0: other than foreign form of ownership of the enterprise
<i>Mix_cap</i>	1: mixed form of ownership; 0: other than mixed form of ownership of the enterprise
<i>Reg_Sale</i>	<i>Company sales scope:</i> 1: regional sales coverage; 0: non-regional
<i>Mainly_EA</i>	1: mainly export; 0: other scope than export
<i>Low_tech</i>	<i>Technological class of the enterprise (according to PKD 2007):</i> 1: low tech; 0: other than low tech

Source: Own study based on own research.

Table 4. Conditions for introducing a completely new product in industrial enterprises (model 1)

Independent value	Odds Ratio
Dom_cap	0.57 *
Reg_Sale	0.54 **
BC	2.02 ***
Stud_app	1.57 **
Meet_pres	1.56 **
Com_cour	0.61 **
Del_Fin_prod	2.17 ***
Unf_Op_Aca	0.28 *
LP_supp	1.67 *
Low_Tech	1.35 *
Sample	380
Likelihood Quotient	57.65
R ² Cox Snell	0.097
R ² Nailerke	0.13
Wald χ^2	57.64
p-value	0.00
Hosmer- Lemeshow test:	
chi square	1.56
p-value	0.29

*** – statistical significance at 1%; ** – statistical significance at 5%; * – statistical significance at 10%.

Source: Own calculation based on questionnaire research.

Table 5. Conditions for introducing completely new processes in industrial enterprise (model 2)

Independent value	Odds Ratio
Mix_cap	1.90 **
For_cap	1.68 *
Mainly_EA	0.39 **
Study_visit	1.62 *
Meet_pres	1.50 *
Han_doc	1.77 **
Del_fin_prod	1.60 **
Loss_TS	1.62 *
Sample	380
Likelihood Quotient	49.60
R ² Cox Snell	0.084
R ² Nailerke	0.129
Wald χ^2	49.6
p-value	0.00
Hosmer- Lemeshow test:	
chi square	1.58
p-value	0.27

*** – statistical significance at 1%; ** – statistical significance at 5%; * – statistical significance at 10%.

Source: own calculation based on questionnaire research.



Effectiveness of European Green Deal implementation in EU countries: a DEA/Benefit-of-the-Doubt approach

JUSTYNA KUJAWSKA

Department of Finance, Faculty of Management and Economics, Gdansk University
of Technology, Narutowicza 11/12, 80-233 Gdansk, Poland

✉ Justyna.Kujawska@pg.edu.pl

 ORCID: 0000-0002-0416-3048

MAGDALENA OLCZYK

Department of Economics, Faculty of Management and Economics, Gdansk University
of Technology, Narutowicza 11/12, 80-233 Gdansk, Poland

✉ Magdalena.Olczyk@pg.edu.pl

 ORCID: 0000-0002-4880-5890

Abstract

Motivation: The European Green Deal (EGD) provides a common EU framework for climate neutrality, resource efficiency and a just transition, but Member States differ markedly in structural conditions and implementation capacity. Existing assessments rely mostly on monitoring exercises, composite indicators or MCDA rankings; less attention has been paid to frontier-based efficiency benchmarking of EGD outcomes.

Aim: The study assesses relative EGD effectiveness in 25 EU countries using a DEA/Benefit-of-the-Doubt approach and Eurostat EGD indicators. The analysis covers 2013–2021, with 2019 treated as the strategic reference point. A SAW index is calculated from 20 transformed indicators, while the DEA/BoD model uses five indicators selected through correlation analysis, variance analysis, PCA and LASSO.

Results: The results show substantial heterogeneity. Sweden, Latvia and Estonia hold strong positions in both the composite indicator and DEA/BoD assessment. In 2021, the efficiency-frontier or super-efficient group includes Sweden, Latvia, Lithuania, Portugal, Estonia, Ireland, the Netherlands, Croatia and Finland, whereas Czechia, Belgium, Poland and Bulgaria show the largest efficiency reserves. Contribution-share and robustness checks indicate the importance of waste generation and PM2.5-related premature mortality. DEA/BoD complements ranking-based assessments by identifying benchmark countries, frontier distance and efficiency reserves.

Keywords: European Green Deal; Data Envelopment Analysis; Benefit-of-the-Doubt; efficiency frontier; European Union; Eurostat indicators

JEL: Q58; C14; O52

1. Introduction

In December 2019, the European Commission presented the European Green Deal (EGD) as a new growth strategy intended to align climate neutrality, resource efficiency, competitiveness and social fairness within a single policy framework (European Commission, 2019; von der Leyen, 2019). The EGD was subsequently strengthened by the European Climate Law, which made climate neutrality by 2050 legally binding and set the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030 compared with 1990 levels (European Union, 2021c). Its implementation is monitored through Eurostat indicators grouped around three policy areas: reducing climate impact, protecting the planet and human health, and enabling a green and just transition. These indicators are important because the EGD is not only a climate policy package; it also concerns the transformation of energy systems, mobility, industrial structures, circular economy practices, environmental protection and distributive fairness.

Despite this common strategic framework, implementation of the EGD is not taking place under homogeneous conditions. More than five years after the announcement of the EGD, recent monitoring by the Joint Research Centre shows that progress has been achieved in several policy areas, but acceleration is still required for many quantified targets and data are not yet available for all targets (Marelli et al., 2025). EU countries differ in energy mix, fossil-fuel dependence, industrial specialisation, innovation capacity, fiscal space, administrative effectiveness, and social exposure to transition costs. The COVID-19 pandemic, the energy crisis, and the geopolitical shock caused by Russia's invasion of Ukraine have further increased pressure on energy security and public finances, while also accelerating the need for clean-energy investment (von Homeyer et al., 2022; Rosenow, 2022; Black & Cisternino, 2025). Recent research also shows that the EGD may strength-

en environmental ambition, but its territorial and socio-economic consequences are uneven across countries and regions (Hereu-Morales et al., 2024; Koundouri et al., 2024; Michalewska-Pawlak, 2024; Topcu et al., 2025). The research problem is therefore not limited to whether EU countries formally implement the EGD; it concerns how effectively different Member States convert their structural conditions and observable sustainability outcomes into progress towards the EGD objectives.

The need for comparative assessment has been increasingly recognised in recent literature. Multi-criteria and composite-indicator studies have evaluated EGD performance by combining indicators on climate, energy, pollution, transport, circularity, and socio-economic transition (Ozdemir et al., 2024; Tutak & Brodny, 2024; Ottomano Palmisano et al., 2025; Olczyk & Kuc-Czarnecka, 2025; Karadağ et al., 2025). These studies provide valuable evidence on the uneven pace of EGD implementation and often identify strong performance among Northern and Western European countries, while highlighting persistent constraints in several Central, Eastern and Southern European Member States. They also demonstrate that monitoring the EGD should move beyond single indicators, as progress in renewable energy, transport decarbonisation, air quality, waste reduction and greenhouse gas intensity is multidimensional and may involve trade-offs.

However, an important research gap remains. Most existing assessments are ranking-oriented and rely on composite indicators or multi-criteria decision-making methods, including PROMETHEE II, MAIRCA, CoCoSo, or related approaches. Such methods are useful for ordering countries according to explicit preference functions, normalisation rules, and weighting schemes. However, they are less suited to identifying which countries form an efficiency frontier and which can serve as feasible benchmarks for others. In contrast, Data Envelopment Analysis (DEA), particularly its Benefit-of-the-Doubt (BoD) formulation, evaluates relative efficiency by allowing the weights of indicators to be determined endogenously for each decision-making unit within a common benchmarking framework (Cherchye et al., 2007; Camanho et al., 2023; Walheer, 2024). This distinction is central for policy evaluation. A DEA/BoD approach does not merely ask which country scores highest in an aggregate ranking; it asks which country achieves the best relative performance given the multidimensional set of EGD outcomes and which peer countries define the frontier of attainable performance.

Against this background, the main objective of the study is to assess the relative effectiveness of EGD implementation in EU countries using the DEA/BoD approach and Eurostat's EGD indicator framework. Although 2019 is used as the strategic reference point because it marked the announcement of the EGD, the empirical window covers 2013–2021. The pre-2019 observations are not interpreted as evidence of EGD implementation, but as a structural baseline against which the first observable post-announcement outcomes can

be assessed. This baseline is justified because the EGD did not emerge in a regulatory vacuum: several policy areas later integrated into the EGD had already been governed by the EU environmental acquis, including biodiversity protection, climate mitigation, pollution reduction, and energy transition. After Croatia's accession in 2013, the analysed Member States operated under a broadly common EU environmental framework, including obligations linked to Natura 2000, the Birds Directive, and the Habitats Directive. Therefore, the 2013–2021 window captures both pre-existing national trajectories and early post-2019 outcomes, while avoiding the misleading assumption that the EGD itself was implemented before 2019. The analysis covers 25 EU countries and applies a multi-stage selection procedure to identify indicators that best represent the multidimensional character of EGD implementation. The following research questions are addressed: (RQ1) How effective are the EU countries included in the dataset in implementing the EGD? (RQ2) Which countries serve as efficiency benchmarks for EGD implementation? (RQ3) Which indicators best capture the multidimensional character of the EGD within the DEA framework? (RQ4) How does a DEA-based assessment complement earlier ranking-based and MCDA-based evaluations?

The novelty of the article lies in shifting the assessment of EGD implementation from a purely ranking-based perspective to an efficiency-frontier perspective. The scientific contribution is threefold. First, the study extends the literature on EU climate and energy policy evaluation by applying DEA/BoD to the Eurostat EGD monitoring framework. Second, it combines DEA with a transparent, multi-stage statistical selection of indicators, reducing redundancy and strengthening the interpretability of the final model. Third, it identifies benchmark countries and those with efficiency reserves, thereby providing information not available from composite rankings alone. The findings have two types of implications. Scientifically, the study contributes to the literature on sustainability measurement by demonstrating how DEA/BoD can complement composite-indicator and MCDA approaches through endogenous weighting, which reduces the arbitrariness of *ex ante* weights. From a policy perspective, it provides a benchmarking tool that may support differentiated intervention, particularly for countries with structural efficiency reserves. The article is organised as follows. Section 2 presents the literature review on EGD implementation, with particular attention to existing assessment methods and the distinction between MCDA-based rankings and DEA-based efficiency analysis. Section 3 describes the data, indicator selection, and DEA/BoD methodology. Section 4 presents the empirical results, including relative efficiency scores, benchmark countries, and cross-country performance patterns. Section 5 discusses the findings in relation to previous studies, structural differences between countries, and policy implications. The final section summarises the main conclusions, limitations, and future research directions.

2. Literature review

The European Green Deal has generated a rapidly expanding body of literature that can be organised into four interrelated strands: policy and institutional analyses of the EGD, empirical monitoring of implementation progress, MCDA and composite indicator assessments, and efficiency-oriented studies using frontier methods. This structure is important because the EGD is not a single environmental target; it is a multidimensional governance framework linking decarbonisation, resource efficiency, biodiversity, transport, health protection, and social fairness. Consequently, assessing its implementation requires methods capable of handling multiple, partly non-commensurable policy outcomes.

The first strand of the literature examines the institutional and political economy foundations of the EGD. Early studies emphasised that the EGD should not be understood solely as an environmental agenda, but also as an industrial, fiscal, and social transformation strategy (Pianta & Lucchese, 2020; Sikora, 2021). Leonard et al. (2021) highlighted the geopolitical dimension of the EGD, particularly the external effects of carbon pricing, energy import dependence, and trade adjustment. Von Homeyer et al. (2022) showed that the energy crisis created new implementation pressures but also strengthened the strategic rationale for accelerating clean energy. These studies clarify the policy context, but they usually do not provide a quantitative, country-level efficiency assessment.

A second group of studies focuses on the territorial and institutional unevenness of EGD implementation. Ciot (2022) showed that Central and Eastern European countries face specific implementation barriers related to inherited energy systems, lower fiscal capacity, and the need for stronger administrative coordination. Michalewska-Pawlak (2024) analysed the impact of the EGD on EU regional policy after 2021 and argued that climate neutrality, environmental protection, and biodiversity have become horizontal priorities in cohesion policy. This finding is relevant for efficiency analysis because countries and regions do not begin the transition from the same structural position. EGD performance therefore depends not only on environmental ambition, but also on the capacity to absorb funds, coordinate investment, and manage place-based transition costs.

Recent sustainability assessments also show that the EGD is unevenly aligned with different dimensions of sustainable development. Hereu-Morales et al. (2024) conducted a systematic analysis of environmental sustainability in the EGD and indicated that implementation challenges remain considerable. Koundouri et al. (2024), using machine-learning text mining of 74 EGD policy documents from 2019–2023, found strong alignment with

SDGs related to clean energy, climate action, and sustainable consumption, but weaker integration of social objectives such as poverty, inequality, health, and decent work. This imbalance supports the view that EGD implementation should be assessed using a multidimensional framework rather than climate indicators alone.

The third strand of the literature develops empirical tools for monitoring EGD progress. The Joint Research Centre report by Marelli et al. (2025) presents one of the most comprehensive policy-monitoring exercises, covering 154 quantifiable targets from 44 policy documents across climate, energy, circular economy, transport, agriculture, biodiversity and pollution. In the academic literature, Olczyk and Kuc-Czarnecka (2025) introduced the European Green Deal Index as a composite tool for monitoring the EU's Green Deal strategy. Their approach is valuable because it consolidates heterogeneous indicators into an interpretable index and reveals cross-country divergence. However, composite indices typically require aggregation rules that may affect the ranking of countries, especially when weights or normalisation choices change (OECD, 2008; Saisana et al., 2005).

Several recent studies have used multi-criteria methods to assess EGD implementation. Ozdemir et al. (2024) proposed a multi-criteria assessment framework for Green Deal performance and demonstrated that EGD evaluation benefits from structured criteria and sensitivity to different sustainability dimensions. Tutak and Brodny (2024) assessed disparities among EU-27 countries in the implementation of EGD strategy goals using a European Green Deal Index based on 18 indicators and a CoCoSo-based multi-criteria approach with hybrid weighting. Their results for 2019–2021 identified Sweden, Denmark and the Netherlands as high performers and showed weaker implementation in many newer Member States. Ottomano Palmisano et al. (2025) applied PROMETHEE II to Eurostat EGD indicators and ranked EU countries according to progress towards EGD implementation. Karadağ et al. (2025) extended the MCDA literature by proposing a hybrid model combining subjective and objective weighting to evaluate Green Deal compliance performance in Türkiye.

Taken together, these studies make an important contribution by moving EGD monitoring beyond isolated indicators. Their limitation lies not in a lack of empirical relevance, but in their evaluation logic. Most translate multiple indicators into a final ranking of countries. Such rankings are useful, but they may obscure the distance to feasible best practice, the peer countries that define that benchmark, and the extent of country-specific efficiency reserves. They are also sensitive to normalisation, preference thresholds, and weighting assumptions.

The closest reference point is Ottomano Palmisano et al. (2025), which applies PROMETHEE II to rank EU countries according to progress towards EGD implementation. The present article differs from that study in three

specific respects: it does not construct a preference-based country ranking; it applies DEA/BoD to identify a relative efficiency frontier and peer benchmarks; and it combines this frontier analysis with systematic indicator selection. Thus, the empirical question shifts from which country ranks higher to which countries define attainable best practice and which countries have efficiency reserves relative to comparable peers.

DEA and the Benefit-of-the-Doubt approach therefore provide a complementary perspective. In the BoD model, a composite indicator is constructed by allowing each country to select the most favourable feasible weights for its own performance profile, subject to the restriction that the same weighting system cannot allow any country to exceed the frontier (Cherchye et al., 2007, 2008). This reduces the arbitrariness of uniform *ex ante* weights and is useful when the theoretical importance of EGD indicators varies across countries due to different energy mixes, industrial structures, or transition constraints. DEA results must still be interpreted carefully, as they are relative, deterministic, and sensitive to the selected variables and outliers (Dyson et al., 2001; Simar & Wilson, 1998).

This study addresses this gap directly. Existing monitoring, composite indicator, and MCDA studies document uneven progress across sectors and countries, but less attention has been given to the relative efficiency of EGD implementation using a DEA/BoD framework combined with systematic variable selection. The present analysis therefore shifts from a purely descriptive or preference-based evaluation of progress to an efficiency-based benchmarking exercise. This enables identification not only of high- and low-performing countries, but also of the policy-relevant frontier against which EGD implementation can be compared.

3. Research methodology

3.1. Data source, country coverage and empirical period

The empirical analysis is based on Eurostat's European Green Deal (EGD) indicator database, which provides harmonised and policy-relevant measures of climate mitigation, energy transition, sustainable mobility, environmental protection, circular economy, and socio-economic transformation. After screening for cross-country and intertemporal availability, 20 indicators were retained. Five indicators were excluded due to incomplete data for the full period: E_1.6, E_2.3, E_2.5, E_2.6, and E_3.7. Cyprus and Malta were omitted because of data gaps, and the United Kingdom was excluded as it is no longer an EU Member State. The final sample therefore consists of 25 EU countries. The complete list of indicators and their classification as stimulants or des-stimulants is reported in Appendix Table 1.

The empirical window covers 2013–2021. The year 2019 is treated as the strategic reference point because the EGD was announced in December 2019. Pre-2019 observations are not interpreted as evidence of EGD implementation; they are used as a post-enlargement structural baseline capturing national trajectories in policy areas later integrated into the EGD. The year 2021 was selected as the final year because it was the latest year with sufficient data completeness. Although Eurostat data ensure formal comparability, the indicators may still reflect reporting differences, publication delays, and proxy measurement. The results should therefore be interpreted as relative benchmarking outcomes rather than absolute measures of EGD compliance.

3.2. Indicator treatment and preliminary composite indicator

Indicators were classified as stimulants or destimulants. Stimulants are variables for which higher values indicate better performance, such as renewable energy share or rail freight transport share. Destimulants are variables for which higher values indicate weaker performance, such as PM2.5-related premature deaths, waste generation per capita, and greenhouse gas emissions intensity. Before aggregation and DEA estimation, all indicators were transformed so that higher values consistently denoted better outcomes.

For stimulants, the min-max transformation was applied:

$$(1) z_{ijt} = \frac{[x_{ijt} - \min(x_i)]}{[\max(x_i) - \min(x_i)]}.$$

For destimulants, the direction was reversed:

$$(2) z_{ijt} = \frac{[\max(x_i) - x_{ijt}]}{[\max(x_i) - \min(x_i)]}.$$

Here, x_{ijt} denotes the original value of indicator i for country j in year t , and z_{ijt} denotes the transformed value. The transformation preserves cross-country ordering while making all indicators compatible with the DEA output interpretation.

A preliminary composite indicator was calculated only for descriptive comparison using Simple Additive Weighting:

$$(3) CI_{jt}^{SAW} = \frac{1}{m} \sum_{i=1}^m z_{ijt}$$

Equal weights were used only at this preliminary stage. The SAW index is not the main efficiency measure; it provides a transparent reference point for comparison with DEA or Benefit-of-the-Doubt results (OECD, 2008; Zhou et al., 2006).

3.3. Variable selection for the DEA model

The DEA model used a reduced set of indicators because DEA is sensitive to the ratio of decision-making units to variables. With 25 countries, including too many outputs would reduce discriminatory power and could classify too many countries as efficient. Indicator selection combined substantive and statistical criteria: consistency with the EGD framework, relevance to climate, environmental and socio-economic transformation, cross-country comparability, interpretability, data availability, sufficient variability, and limited redundancy.

Four complementary methods were applied. Correlation analysis identified indicators strongly associated with the remaining variables. Variance analysis selected indicators with high cross-country variability. Principal Component Analysis reduced redundancy and identified variables with high loadings on the main components. LASSO regression retained variables with non-zero coefficients under regularisation. For PCA and LASSO, variables were standardised before estimation to avoid scale effects.

The final selection was based on the frequency with which indicators appeared across the four methods and on theoretical relevance. Five indicators were retained: E1_4, E1_9, E2_7, E2_8, and E3_8. Together, they represent the multidimensional structure of the EGD: renewable energy share captures climate and energy transition; rail freight transport share captures sustainable mobility; PM2.5-related premature deaths capture environmental quality and health; waste generation per capita captures circular economy pressure; and GHG emissions intensity of employment captures the link between environmental burden and production structure. The results of the variable selection procedure are summarised in Appendix Table 2.

3.4. DEA/Benefit-of-the-Doubt model and weights

Relative efficiency was assessed using Data Envelopment Analysis in its Benefit-of-the-Doubt (BoD) formulation (Charnes et al., 1978; Cherchye et al., 2007, 2008). Each country is treated as a decision-making unit. The five transformed EGD indicators are included in the model as outputs. The baseline multiplier model for country k in year t is:

$$(4) \text{ } CI_{kt} = \max_{u_{ikt}} \sum_{i=1}^m u_{ikt} z_{ikt}$$

subject to: $i=1 \sum u_{ikt} z_{ijt} \leq 1, j=1, \dots, n; u_{ikt} \geq 0, i=1, \dots, m$.

Here, CI_{kt} is the DEA/BoD score, u_{ikt} is the weight assigned to indicator i when country k is evaluated, m is the number of outputs and n is the number of countries.

Weights are determined endogenously by the optimisation problem. Each country may select the most favourable feasible non-negative weights for its own profile, provided that the same weights do not allow any country to exceed the frontier. Thus, the weights are country-specific shadow weights, not normative importance coefficients. No additional lower or upper weight restrictions were imposed beyond non-negativity. This limits arbitrary ex ante weighting, but also means that some indicators may receive very low or zero weights for specific countries.

3.5. Single input, undesirable outputs and DEA assumptions

The BoD specification uses one non-discretionary input fixed at 1 for all countries. This is a technical normalising input, not public expenditure, labour, capital or energy use. Its function is to anchor the DEA model and allow multiple policy outcomes to be assessed within a common frontier. It is non-discretionary because it is not subject to reduction or managerial control. The study therefore evaluates relative outcome efficiency, not expenditure efficiency.

Undesirable outputs were transformed before estimation because DEA treats outputs as desirable and assumes that more output is better. In the final DEA set, E2_7, E2_8 and E3_8 are destimulants. After transformation, lower mortality, waste and emissions intensity are represented by higher transformed values (Seiford & Zhu, 2002; Lewis & Sexton, 2004).

The baseline specification assumes constant returns to scale. A VRS specification was also tested, but with one homogeneous technical input it produced non-discriminatory scores of one for all countries; therefore, the CRS/BoD specification was retained as the meaningful baseline. This choice is consistent with the unit input and with normalised policy outcomes rather than absolute measures of national production scale. The analysed countries are treated as comparable decision-making units because they operate under a common EU policy framework, although they differ in energy mix, industrial structure, fiscal capacity, and administrative effectiveness. DEA is deterministic and does not separate statistical noise from inefficiency; measurement error, outliers, and variable selection may therefore affect the frontier. With 25 countries, one input, and five outputs, the model satisfies the common rule of thumb requiring the number of units to exceed three times the total number of inputs and outputs.

3.6. Super-efficiency, robustness logic and interpretation

For finer discrimination among efficient countries, a super-efficiency extension was applied. In this specification, the evaluated country is excluded from its own reference set, allowing countries located on the frontier to be

ranked. Values above 1 indicate that a country remains above the frontier constructed without itself, while values below 1 indicate relative inefficiency.

Robustness was addressed through multi-method indicator selection, dimensionality reduction, alternative transformation, leave-one-indicator-out specifications and frontier-outlier stress tests. The results should be interpreted as relative benchmarking outcomes, not causal estimates. A country on the DEA frontier is efficient only relative to the analysed sample and selected indicators; it may still face environmental or institutional challenges. Future extensions may add bootstrap DEA, panel DEA or Malmquist indices once longer post-2019 data series become available.

4. Results

4.1. Composite indicator results as a descriptive reference

The empirical analysis first reports the SAW-based composite indicator as a descriptive reference. Appendix Table 3 presents CI values for 25 EU countries in 2013, 2019 and 2021. The CI combines all 20 transformed EGD indicators with equal weights; it is therefore treated as a transparent overview of aggregate performance, not as the main efficiency measure.

Sweden, Latvia and Estonia remain at the top of the CI ranking, with Slovenia and Austria also consistently high. Ireland, Bulgaria and Greece record the weakest CI values, while Poland, Romania and Spain remain in the lower part of the distribution. Germany and France occupy mid-ranking positions, indicating that economic scale does not automatically translate into balanced aggregate EGD performance. Portugal records the strongest upward movement, from 19th in 2013 to 11th in 2021, whereas Belgium and Czechia display more unstable positions.

4.2. DEA/BoD efficiency scores and the efficiency frontier

The DEA/BoD results in Appendix Table 4 provide the main efficiency-oriented assessment. Unlike the CI, which applies equal weights, DEA/BoD evaluates relative efficiency using country-specific endogenous weights and identifies countries located on or above the estimated frontier. Differences between CI and DEA rankings are therefore not inconsistencies, but indicate that aggregate performance and relative efficiency reflect different aspects of EGD implementation.

Sweden, Latvia and Estonia rank highly in both approaches, suggesting strong aggregate performance combined with high relative efficiency. Other countries show divergence. Ireland has the lowest CI value in 2021 but a high DEA/BoD score, while Portugal and Lithuania perform better in DEA than in the CI ranking. This suggests that weaker average performance across

the full indicator set may coexist with favourable relative efficiency in the reduced DEA model. The 2021 DEA/BoD classification (Appendix Table 5) distinguishes frontier or super-efficient countries, near-efficient countries, moderate-efficiency countries, and countries with the largest efficiency gaps. The lowest group includes Czechia, Belgium, Poland and Bulgaria, with Bulgaria remaining last in both 2019 and 2021.

To increase transparency of the DEA/BoD results, normalised contribution shares and robustness checks were additionally calculated (Supplementary Annex, Tables A1–A6). In 2021, the largest average contribution to the DEA/BoD score was associated with E2_8 (waste generation; 35.97%), followed by E2_7 (PM2.5-related premature deaths; 28.73%), E3_8 (GHG emissions intensity of employment; 16.79%), E1_9 (rail freight transport; 12.04%) and E1_4 (renewable energy; 6.47%). E2_8 contributed positively in 76% of countries and was the dominant contributor in eight countries, whereas E2_7 contributed positively in 64% of countries and dominated in ten countries. The robustness checks confirmed the stability of the baseline results. The alternative min-max transformation with reversed destimulants produced identical rankings in 2013, 2019 and 2021 (Spearman's $\rho = 1.000$). In the 2021 leave-one-indicator-out test, the ranking remained highly stable after excluding E1_4 ($\rho = 0.998$) and remained stable or moderately stable after excluding E2_8 ($\rho = 0.912$), E3_8 ($\rho = 0.893$) and E1_9 ($\rho = 0.824$). The largest change occurred after excluding E2_7 ($\rho = 0.552$), confirming that PM2.5-related premature mortality is the most influential indicator for the estimated frontier. Additional 2021 frontier-outlier tests also supported the stability of the results: after excluding Sweden, Spearman's ρ equalled 0.982, and after excluding Sweden and Latvia, it equalled 0.946.

4.3. Changes between the pre-EGD baseline, 2019 reference year and 2021

Because the EGD was announced in December 2019, the 2013 results are interpreted as a pre-EGD structural baseline, while 2019–2021 captures early post-announcement outcomes. The longer 2013–2021 comparison shows substantial gains for Lithuania, Greece, Luxembourg and the Netherlands in DEA ranks, and a large CI improvement for Portugal. The shorter 2019–2021 comparison is more directly linked to the first observable post-announcement period: Lithuania and the Netherlands improve markedly in DEA, Greece and Luxembourg continue upward movement, whereas Bulgaria, Poland, Belgium and Czechia remain in the lower part of the efficiency distribution. These changes suggest uneven early progress conditioned by pre-existing national trajectories.

The observed cross-country differences may be associated with energy mix, transport structure, exposure to high-emission sectors, administrative

capacity and earlier environmental policy paths. However, these factors are contextual explanations, not causal effects identified by the DEA model.

4.4. Indicator profiles of leading and lagging countries

The final part of the results examines the 2021 indicator profiles of leading and lagging countries. Chart 1 does not identify causal drivers of DEA efficiency, nor does it report DEA weights or slack values. It shows how the selected transformed indicators differ between the leading group, represented by Sweden, Latvia and Estonia, and the lagging group, represented by Bulgaria, Poland and Belgium.

The leading group displays stronger transformed values for renewable energy, rail freight transport, and selected environmental-health outcomes. The lagging group shows weaker profiles, particularly in PM2.5-related premature mortality, waste generation, and greenhouse gas emissions intensity of employment. These profiles help explain the empirical structure of the DEA/BoD scores without implying that any single indicator causally determines the ranking.

Overall, the results reveal three patterns: stable leadership by several Northern and Baltic countries, improvement in selected countries such as Lithuania, Greece and the Netherlands, and persistent efficiency reserves in Bulgaria, Poland, Belgium and Czechia. The following discussion relates these patterns to previous MCDA and composite indicator studies, and to structural differences between Member States.

5. Discussion

The DEA/BoD results provide an efficiency-frontier interpretation of European Green Deal implementation, rather than another aggregate country ranking. Three findings are particularly important. First, Sweden, Latvia and Estonia combine strong composite indicator performance with high DEA/BoD efficiency, confirming their robust position across both evaluation approaches. Second, some countries, such as Lithuania, Portugal, Ireland and the Netherlands, perform better in the DEA/BoD framework than in the equal-weighted composite indicator. This suggests that weaker average performance across the full set of indicators may coexist with relatively efficient performance in the reduced DEA model. Third, Bulgaria, Poland, Belgium and Czechia remain the countries with the largest relative efficiency reserves in 2021. These results show that the EGD implementation gap is not only a matter of aggregate performance, but also of how effectively countries convert their observable environmental and transition-related outcome profiles into frontier performance.

These findings are broadly consistent with recent monitoring and stock-taking exercises, which show that EGD progress across Member States remains uneven and that acceleration is required in several policy areas. They are also consistent with composite indicator and MCDA studies that identify stronger performance among Northern and selected Western European countries, and weaker performance among several Central, Eastern and Southern European countries. However, the present results also show why DEA/BoD should be interpreted as a complementary approach rather than a substitute for ranking-based methods. Composite indicators and MCDA methods, including PROMETHEE II or CoCoSo-based approaches, are useful for ordering countries according to explicit aggregation, normalisation and preference rules. DEA/BoD instead identifies the empirical efficiency frontier, peer benchmarks and country-specific efficiency reserves under endogenous weights. Therefore, differences between the DEA/BoD results and previous rankings should not be treated as inconsistencies. They reflect different evaluation questions: ranking-based studies ask which country scores higher, whereas the present approach asks which countries define attainable best practice given the selected multidimensional EGD outcomes.

The closest point of comparison is the PROMETHEE II-based assessment by Ottomano Palmisano et al. (2025). That study identifies Sweden, Austria, and the Netherlands as high performers, and Ireland, Luxembourg, and Cyprus as low performers. The present analysis confirms the strong position of Sweden and the Netherlands, but also shows that countries such as Ireland, Lithuania, and Portugal can appear more efficient in a DEA/BoD framework than in ranking-based or equal-weighted assessments. This difference arises from the logic of the method. PROMETHEE II relies on pairwise comparisons and preference functions, while DEA/BoD allows each country to use the most favourable feasible weights for its own outcome profile, subject to the common frontier constraint. The analysis therefore does not replicate the previous ranking; it adds information on relative efficiency, benchmark status, and efficiency reserves. Similarly, the findings are consistent with Olczyk and Kuc-Czarnecka's (2025) evidence on increasing divergence in EGD-related composite indicators, but extend that result by showing where divergence is reflected in frontier distance rather than only in aggregate scores.

The contribution-share results clarify which dimensions of the reduced DEA model are most relevant for the estimated frontier. In 2021, waste generation and PM2.5-related premature mortality made the largest average contributions to the DEA/BoD scores, followed by greenhouse gas emissions intensity of employment, rail freight transport, and renewable energy. The leave-one-indicator-out test further indicates that PM2.5-related premature mortality is the most influential variable for the stability of the 2021 ranking. This suggests that EGD efficiency, as captured in the present model, is not driven solely by climate-energy indicators. Environmental health, waste

pressure, and emissions intensity of production structures also play a central role. This is important for policy interpretation because it indicates that the Green Deal should be evaluated as a multidimensional transition involving air quality, circular economy, transport, and production structure, not only renewable energy deployment.

Although DEA does not identify causal mechanisms, the observed cross-country differences can be interpreted in light of structural, institutional, and sectoral conditions. Countries closer to the frontier tend to display more favourable combinations of renewable energy performance, transport structure, air quality outcomes, waste indicators, and emissions intensity. Countries with larger efficiency reserves often face more challenging starting conditions, including higher dependence on fossil fuels, a larger role for emissions-intensive sectors, weaker air quality outcomes, lower circular economy performance, or more limited administrative capacity to implement complex transition policies. These factors do not constitute causal effects in the econometric sense, but they provide a plausible interpretation of why countries operating under the same EU strategic framework may differ in relative EGD efficiency.

The results also have policy implications. For countries located on or above the frontier, the main challenge is to maintain performance and disseminate transferable practices, especially in areas such as air quality management, circular economy policies, rail-oriented freight systems, and emissions intensity reduction. For near-efficient and moderate-efficiency countries, the priority is to remove specific bottlenecks rather than redesign the entire transition framework. This may involve accelerating permitting procedures, improving coordination across ministries and agencies, strengthening investment pipelines, and targeting sectors where the selected indicators reveal weaker performance. For low-efficiency countries, including Bulgaria, Poland, Belgium, and Czechia in the 2021 classification, more targeted support may be needed. Policy attention should focus on areas with the largest observed efficiency reserves, particularly air quality improvement, waste reduction, emissions intensity of employment, and transport decarbonisation. EU-level instruments, including cohesion policy, the Just Transition Mechanism, and green investment support, should therefore be linked not only to formal compliance with EGD targets, but also to measurable progress in reducing frontier distance.

Several interpretive limitations should be emphasised. First, DEA/BoD evaluates relative outcome efficiency, not absolute EGD compliance. A country located on the frontier is efficient only relative to the analysed sample and selected indicators; it may still face environmental or social challenges. Second, the endogenous weights used in the BoD model are shadow weights, not normative importance coefficients. They indicate how a country achieves its best feasible score within the model, but should not be interpreted as policy

priorities in themselves. Third, the use of a single unit input means the model does not evaluate expenditure efficiency, labour productivity, or fiscal effort. It compares multidimensional outcome profiles under a common normalising input. Fourth, DEA is deterministic and may be sensitive to measurement error, outliers, and variable selection. The robustness checks reported in the study mitigate this concern, but do not eliminate it completely. Finally, Eurostat indicators are harmonised and policy-relevant, but may still reflect reporting delays, proxy measurement, and differences in national data systems. For these reasons, the results should be interpreted as a comparative benchmarking exercise rather than as a causal or exhaustive assessment of Green Deal implementation.

6. Conclusion

The relative effectiveness of European Green Deal (EGD) implementation in EU countries was assessed using a DEA/Benefit-of-the-Doubt framework based on Eurostat EGD indicators. The empirical design combined a descriptive SAW composite indicator, constructed from 20 transformed indicators, with an efficiency-frontier model based on five selected indicators: renewable energy share, rail freight transport share, PM2.5-related premature mortality, waste generation per capita, and greenhouse gas emissions intensity of employment. This approach enabled the evaluation of EGD implementation both as an aggregate ranking problem and as a frontier-based benchmarking problem focused on relative outcome efficiency, peer benchmarks, and efficiency reserves.

The results reveal substantial heterogeneity across Member States. Sweden, Latvia, and Estonia hold strong positions in both the composite indicator and DEA/BoD assessment, indicating stable performance across both evaluation approaches. In the 2021 DEA/BoD classification, the efficiency-frontier or super-efficient group comprises Sweden, Latvia, Lithuania, Portugal, Estonia, Ireland, the Netherlands, Croatia, and Finland. The low-efficiency group includes Czechia, Belgium, Poland, and Bulgaria. The comparison between the composite indicator and DEA/BoD scores also demonstrates that aggregate performance and relative efficiency are not identical. Countries such as Ireland, Lithuania, and Portugal perform more favourably in the DEA/BoD framework than in the composite indicator.

The contribution-share and robustness results further clarify the interpretation of the model. In 2021, the largest average contributions to DEA/BoD scores were associated with waste generation and PM2.5-related premature mortality, followed by greenhouse gas emissions intensity of employment, rail freight transport, and renewable energy. The leave-one-indicator-out checks indicate that the ranking is particularly sensitive to PM2.5-related premature mortality, while the alternative transformation and frontier-out-

lier tests confirm a high level of overall robustness. These findings suggest that EGD efficiency should not be interpreted solely through climate-energy indicators. Environmental health, circular economy pressure, transport structure, and emissions intensity also play a central role in the relative performance of Member States.

Several policy implications arise from the results. For countries located on or above the frontier, policy should focus on maintaining performance and disseminating transferable practices, particularly in air-quality management, circular-economy policies, rail-oriented freight systems, and emissions-intensity reduction. For near-efficient and moderate-efficiency countries, priority should be given to removing specific bottlenecks, such as administrative delays, weak investment pipelines, insufficient coordination across public institutions, and sector-specific transition barriers. For low-efficiency countries, more targeted support is needed in areas where the greatest efficiency reserves are evident. In particular, air-quality improvement, waste reduction, emissions-intensity reduction, and transport decarbonisation should be more closely linked with cohesion policy, the Just Transition Mechanism, and green investment support. The results therefore support differentiated policy intervention rather than a uniform implementation model for all Member States.

The scientific contribution of the article is to shift the assessment of EGD implementation from a purely ranking-based perspective to an efficiency-frontier perspective. Composite indicators and MCDA methods remain useful for ordering countries according to explicit aggregation or preference rules. However, DEA/BoD provides information on the countries that define attainable best practice, the distance of other countries from that frontier, and the extent of efficiency reserves. In this sense, the analysis complements earlier MCDA and composite-indicator studies by showing how endogenous weights and frontier benchmarking can be used to assess multidimensional EGD outcomes. The findings also confirm that differences in EGD implementation should be interpreted in the context of structural and institutional conditions, including energy mix, dependence on fossil fuels, transport structure, exposure to emissions-intensive sectors, and administrative capacity. These contextual factors do not constitute causal effects identified by the model, but they provide a plausible interpretation of cross-country differences in relative efficiency.

Several limitations should be emphasised. First, the DEA/BoD scores are relative to the analysed sample and selected indicators; a country located on the frontier should not be interpreted as fully compliant with all EGD objectives. Second, the single unit input is a technical normalising input, not a measure of public expenditure, labour, capital, or energy use. The model therefore evaluates relative outcome efficiency rather than expenditure efficiency. Third, DEA is deterministic and does not separate statistical noise

from inefficiency, making results sensitive to measurement error, outliers, and variable selection. Fourth, the Eurostat indicators are harmonised and policy-relevant, but may still reflect reporting delays, proxy measurement, and differences in national data systems. Fifth, the analysis does not identify causal mechanisms, and the pre-2019 observations should be interpreted as a structural baseline rather than as evidence of EGD implementation before the strategy was announced.

Future research should extend the analysis when longer post-2019 Eurostat time series become available. Panel DEA, Malmquist productivity indices, and bootstrap DEA could be used to evaluate changes in efficiency over time and to assess the statistical stability of the frontier. DEA results could also be triangulated with stochastic frontier analysis, MCDA methods, or machine learning approaches to test how different modelling assumptions affect country classifications. Further extensions should include regional-level analysis, additional institutional and policy variables, information on EU funding absorption, and more detailed indicators of administrative capacity. Such extensions would allow a more precise assessment of how structural conditions, public policy design, and investment capacity affect the relative effectiveness of EGD implementation.

References

- Black, C., & Cisternino, S. (Eds). (2025). Delivering the EU Green Deal – Progress towards targets. Publications Office of the European Union. <https://op.europa.eu/en/publication-detail/-/publication/33a4bbe1-e2b0-11ef-be2a-01aa75ed71a1/language-en>
- Camanho, A. S., Mello, J., & Dyson, R. G. (2023). Benefit-of-the-doubt composite indicators and use of weight restrictions. In P. Macedo, V. Moutinho, & M. Madaleno (Eds.), *Advanced mathematical methods for economic efficiency analysis* (pp. 93–112). Springer. https://doi.org/10.1007/978-3-031-29583-6_6
- Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision-making units. *European Journal of Operational Research*, 2(6), 429–444. [https://doi.org/10.1016/0377-2217\(78\)90138-8](https://doi.org/10.1016/0377-2217(78)90138-8)
- Cherchye, L., Moesen, W., Rogge, N., & Van Puyenbroeck, T. (2007). An introduction to ‘benefit of the doubt’ composite indicators. *Social Indicators Research*, 82(1), 111–145. <https://doi.org/10.1007/s11205-006-9029-7>
- Cherchye, L., Moesen, W., Rogge, N., Van Puyenbroeck, T., Saisana, M., Saltelli, A., Liska, R., & Tarantola, S. (2008). Creating composite indicators with DEA and robustness analysis: The case of the Technology Achievement Index. *Journal of the Operational Research Society*, 59(2), 239–251. <https://doi.org/10.1057/palgrave.jors.2602445>

- Ciot, M. G. (2022). Implementation perspectives for the European Green Deal in Central and Eastern Europe. *Sustainability*, 14(7), Article 3947. <https://doi.org/10.3390/su14073947>
- Dyson, R. G., Allen, R., Camanho, A. S., Podinovski, V. V., Sarrico, C. S., & Shale, E. A. (2001). Pitfalls and protocols in DEA. *European Journal of Operational Research*, 132(2), 245–259. [https://doi.org/10.1016/S0377-2217\(00\)00149-1](https://doi.org/10.1016/S0377-2217(00)00149-1)
- European Commission. (2019). The European Green Deal (COM(2019) 640 final). Retrieved 20.11.2024 from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2019:640:FIN>
- European Union. (2021c). Regulation (EU) 2021/1119 establishing the framework for achieving climate neutrality ('European Climate Law'). *Official Journal of the European Union*, L 243, 1–17.
- Eurostat. (2023). European Green Deal indicators. European Commission. Retrieved 20.11.2024 from <https://ec.europa.eu/eurostat/web/european-green-deal/indicators>.
- Hereu-Morales, J., Segarra, A., & Valderrama, C. (2024). The European (Green?) Deal: A systematic analysis of environmental sustainability. *Sustainable Development*, 32(1), 647–661. <https://doi.org/10.1002/sd.2671>
- Karadağ, M., Gül, M., Yücesan, M., Ortiz-Barrios, M., Ishizaka, A., & Khan, J. (2025). Evaluation of Green Deal compliance performance with a hybrid comparative multi-attribute decision model. *Socio-Economic Planning Sciences*, 98, Article 102163. <https://doi.org/10.1016/j.seps.2025.102163>
- Koundouri, P., Alamanos, A., Plataniotis, A., Stavridis, C., Perifanos, K., & Devves, S. (2024). Assessing the sustainability of the European Green Deal and its interlinkages with the SDGs. *npj Climate Action*, 3, Article 23. <https://doi.org/10.1038/s44168-024-00104-6>
- Leonard, M., Pisani-Ferry, J., Shapiro, J., Tagliapietra, S., & Wolf, G. (2021). The geopolitics of the European Green Deal. *International Organisations Research Journal*, 16(2), 204–235. <https://doi.org/10.17323/1996-7845-2021-02-10>
- Lewis, H. F., & Sexton, T. R. (2004). Data envelopment analysis with reverse inputs and outputs. *Journal of Productivity Analysis*, 21(2), 113–132. <https://doi.org/10.1023/B:PROD.0000016868.69586.b4>
- Marelli, L., Trane, M., Barbero Vignola, G., Gastaldi, C., Guerreiro Miguel, M., Delgado Callicó, L., Borchardt, S., Mancini, L., Sanye Mengual, E., Gourdon, T., et al. (2025). Delivering the EU Green Deal – Progress towards targets. Publications Office of the European Union. <https://doi.org/10.2760/3105205>
- Michalewska-Pawlak, M. (2024). The impact of the European Green Deal strategy on the evolution of EU regional policy after 2021. *Politeja*, 21(1(88/2)), 227–239. <https://doi.org/10.12797/Politeja.20.2024.88.2.15>

- OECD. (2008). Handbook on constructing composite indicators: Methodology and user guide. OECD Publishing. <https://doi.org/10.1787/9789264043466-en>
- Olczyk, M., & Kuc-Czarnecka, M. (2025). European Green Deal Index: A new composite tool for monitoring European Union's Green Deal strategy. *Journal of Cleaner Production*, 495, Article 145077. <https://doi.org/10.1016/j.jclepro.2025.145077>
- Ottomano Palmisano, G., Rocchi, L., Negri, L., & Piscitelli, L. (2025). Evaluating the progress of the EU countries towards implementation of the European Green Deal: A multiple criteria approach. *Land*, 14(1), Article 141. <https://doi.org/10.3390/land14010141>
- Ozdemir, S., Demirel, N., Zaralı, F., & Çelik, T. (2024). Multi-criteria assessment framework for evaluation of Green Deal performance. *Environmental Science and Pollution Research*, 31, 4686–4704. <https://doi.org/10.1007/s11356-023-31370-2>
- Pianta, M., & Lucchese, M. (2020). Rethinking the European Green Deal: An industrial policy for a just transition in Europe. *Review of Radical Political Economics*, 54(2), 633–641. <https://doi.org/10.1177/0486613420938207>
- Rosenow, J. (2022). Europe on the way to net zero: What challenges and opportunities? *PLOS Climate*, 1(7), Article e0000058. <https://doi.org/10.1371/journal.pclm.0000058>
- Saisana, M., Saltelli, A., & Tarantola, S. (2005). Uncertainty and sensitivity analysis techniques as tools for the quality assessment of composite indicators. *Journal of the Royal Statistical Society: Series A*, 168(2), 307–323. <https://doi.org/10.1111/j.1467-985X.2005.00350.x>
- Seiford, L. M., & Zhu, J. (2002). Modeling undesirable factors in efficiency evaluation. *European Journal of Operational Research*, 142(1), 16–20. [https://doi.org/10.1016/S0377-2217\(01\)00293-4](https://doi.org/10.1016/S0377-2217(01)00293-4)
- Sikora, A. (2021). European Green Deal – Legal and financial challenges of the climate change. *ERA Forum*, 21(4), 681–697. <https://doi.org/10.1007/s12027-020-00637-3>
- Simar, L., & Wilson, P. W. (1998). Sensitivity analysis of efficiency scores: How to bootstrap in nonparametric frontier models. *Management Science*, 44(1), 49–61. <https://doi.org/10.1287/mnsc.44.1.49>
- Topcu, M., Ozdemir, S., & Demirel, N. (2025). Exploring the role of socio-economic factors in European Green Deal performance. *Environmental Conservation*, 52(4), 188–195. <https://doi.org/10.1017/S0376892925100106>
- Tutak, M., & Brodny, J. (2024). Disparities among EU-27 countries in the implementation of the European Green Deal strategy goals. *Smart and Sustainable Built Environment*. Advance online publication. <https://doi.org/10.1108/SASBE-07-2024-0266>

- von der Leyen, U. (2019). Political guidelines for the next European Commission 2019–2024. European Commission. https://commission.europa.eu/document/download/063d44e9-04ed-4033-acf9-639ecb187e87_en?filename=political-guidelines-next-commission_en.pdf
- von Homeyer, I., Oberthür, S., & Dupont, C. (2022). Implementing the European Green Deal during the evolving energy crisis. *Journal of Common Market Studies*, 60(S1), 125–136. <https://doi.org/10.1111/jcms.13397>
- Walheer, B. (2024). A sequential benefit-of-the-doubt composite indicator. *European Journal of Operational Research*, 316(1), 228–239. <https://doi.org/10.1016/j.ejor.2024.01.029>
- Zhou, P., Ang, B. W., & Poh, K. L. (2006). Comparing aggregating methods for constructing the composite environmental index: An objective measure. *Ecological Economics*, 59(3), 305–311. <https://doi.org/10.1016/j.ecolecon.2005.10.018>

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Appendix

Box 1. Comparison of EGD assessment approaches

Descriptive monitoring: tracks official indicators and targets; transparent and policy-aligned, but does not synthesise multidimensional performance or identify benchmarks.
Composite indicators: summarise many indicators into one score; clear for communication, but sensitive to normalisation, aggregation and weights.
MCDA methods: rank countries under explicit preference rules; useful for multi-criteria ordering, but dependent on preference functions, thresholds and weights.
DEA/BoD: identifies an efficiency frontier, peers and efficiency reserves through endogenous weights; informative for benchmarking, but relative and sensitive to variable selection and outliers.

Source: own elaboration.

Table 1. European Green Deal Indicators

Indicator	Direction (S/D)	Source
E_1.1 Greenhouse gas emissions	D	Eurostat – EGD indicator E_1.1 (Index, 1990=100)
E_1.2 Greenhouse gas emissions by sector	D	Eurostat – EGD indicator E_1.2 (% of total, energy sector share)
E_1.3 Climate related economic losses	D	Eurostat – EGD indicator E_1.3 (euro per inhabitant, constant prices)
E_1.4 Renewable energy by sector	S	Eurostat – EGD indicator E_1.4 (% of gross final energy consumption)
E_1.5 Primary energy consumption	D	Eurostat – EGD indicator E_1.5 (MWh)



Indicator	Direction (S/D)	Source
E_1.6 Final energy consumption in households by use	D	Eurostat – EGD indicator E_1.6 (GJ per capita)
E_1.7 Zero-emission vehicles	S	Eurostat – EGD indicator E_1.7 (% of new registrations; passenger cars, etc.)
E_1.8 Passenger transport by mode (rail)	S	Eurostat – EGD indicator E_1.8 (% in total inland passenger-km)
E_1.9 Freight transport by mode (rail)	S	Eurostat – EGD indicator E_1.9 (% in total inland freight tonne-km)
E_2.1 Forest and other wooded land	S	Eurostat – EGD indicator E_2.1 (% of total land area)
E_2.2 Protected areas	S	Eurostat – EGD indicator E_2.2 (% of total area; terrestrial/marine)
E_2.3 Common bird index	S	Eurostat – EGD indicator E_2.3 (index)
E_2.4 Area under organic farming	S	Eurostat – EGD indicator E_2.4 (% of utilised agricultural area)
E_2.5 Nitrate in groundwater	D	Eurostat – EGD indicator E_2.5 (mg NO ₃ /l)
E_2.6 Consumption of chemicals by hazardousness	D	Eurostat – EGD indicator E_2.6 (tonnes)
E_2.7 Premature deaths (PM2.5)	D	Eurostat – EGD indicator E_2.7 (rate attributable to PM2.5)
E_2.8 Generation of waste by hazardousness	D	Eurostat – EGD indicator E_2.8 (kg per capita; hazardous/non-hazardous total)
E_3.1 Raw material consumption	D	Eurostat – EGD indicator E_3.1 (tonnes per capita, total)
E_3.2 Circular material use rate	S	Eurostat – EGD indicator E_3.2 (% of material input for domestic use)
E_3.3 Gross domestic expenditure on R&D	S	Eurostat – EGD indicator E_3.3 (% of GDP; total)
E_3.4 Population unable to keep home adequately warm	D	Eurostat – EGD indicator E_3.4 (% of population)
E_3.5 High-speed internet coverage	S	Eurostat – EGD indicator E_3.5 (% of households; NGA coverage)
E_3.6 Environmental tax revenues	S	Eurostat – EGD indicator E_3.6 (% of total tax revenue)
E_3.7 Expenditure on environmental protection	S	Eurostat – EGD indicator E_3.7 (level)
E_3.8 GHG emissions intensity of employment	D	Eurostat – EGD indicator E_3.8 (tonnes CO ₂ per employed person)

Notes: S = stimulant (higher is better); D = destimulant (higher is worse).

Sources refer to the Eurostat European Green Deal indicator metadata/codes.

Table 2. Selection of DEA indicators

Selection method	Top 5 (2013)	Top 5 (2019)	Top 5 (2021)
Correlation matrix	E3_3, E2_7, E1_4, E3_1, E2_1	E2_7, E3_3, E1_4, E3_1, E2_1	E1_4, E2_7, E3_3, E3_1, E2_1
Variance analysis	E2_8, E3_8, E1_2, E1_5, E2_7	E2_8, E3_8, E1_2, E1_5, E2_7	E2_8, E3_8, E1_2, E1_5, E2_7
PCA	E2_2, E2_1, E2_8, E1_2, E1_5	E3_2, E1_2, E1_9, E1_5, E1_8	E3_1, E1_9, E1_5, E2_8, E1_2
LASSO	E1_4, E2_2, E3_8, E3_2, E1_9	E2_1, E3_8, E3_4, E2_7, E1_9	E1_5, E1_4, E2_2, E3_8, E1_9
Frequency-based shortlist	E3_2, E1_9, E2_8, E1_4, E2_7	E3_2, E1_9, E2_8, E1_8, E1_4	E1_9, E2_8, E1_4, E2_7, E3_8
Final set	E1_4, E1_9, E2_7, E2_8, E3_8		

Source: own calculations.



Table 3. Composite indicators related to EGD implementation for 25 EU countries in the years 2013, 2019, and 2021

No	Country	2013		2019		2021		Rank Δ 2013–2021	Rank Δ 2019–2021
		CI value	Rank	CI value	Rank	CI value	Rank		
1	Austria	0.451	6	0.498	5	0.519	5	▲ 1	—
2	Belgium	0.350	21	0.399	14	0.402	17	▲ 4	▼ 3
3	Bulgaria	0.335	22	0.367	20	0.339	24	▼ 2	▼ 4
4	Croatia	0.440	7	0.466	7	0.481	7	—	—
5	Czechia	0.368	16	0.399	13	0.385	19	▼ 3	▼ 6
6	Denmark	0.381	13	0.395	16	0.406	16	▼ 3	—
7	Estonia	0.532	3	0.578	1	0.555	2	▲ 1	▼ 1
8	Finland	0.459	5	0.480	6	0.498	6	▼ 1	—
9	France	0.373	14	0.378	17	0.402	18	▼ 4	▼ 1
10	Germany	0.360	18	0.407	12	0.422	13	▲ 5	▼ 1
11	Greece	0.305	24	0.348	23	0.377	21	▲ 3	▲ 2
12	Hungary	0.388	12	0.376	18	0.410	14	▼ 2	▲ 4
13	Ireland	0.281	25	0.284	25	0.312	25	—	—
14	Italy	0.371	15	0.397	15	0.408	15	—	—
15	Latvia	0.562	2	0.578	2	0.552	3	▼ 1	▼ 1
16	Lithuania	0.429	8	0.422	11	0.427	12	▼ 4	▼ 1
17	Luxembourg	0.397	11	0.431	10	0.439	9	▲ 2	▲ 1
18	Netherlands	0.414	10	0.462	8	0.470	8	▲ 2	—
19	Poland	0.325	23	0.346	24	0.346	23	—	▲ 1
20	Portugal	0.358	19	0.367	21	0.429	11	▲ 8	▲ 10
21	Romania	0.352	20	0.376	19	0.379	20	—	▼ 1
22	Slovakia	0.415	9	0.437	9	0.439	10	▼ 1	▼ 1
23	Slovenia	0.509	4	0.536	4	0.521	4	—	—
24	Spain	0.365	17	0.354	22	0.364	22	▼ 5	—
25	Sweden	0.571	1	0.557	3	0.599	1	—	▲ 2

Source: own calculations based on Eurostat (2023).

Table 4. DEA/BoD efficiency scores related to EGD implementation for 25 EU countries in the years 2013, 2019, and 2021

No	DMU	2013		2019		2021		Rank Δ 2013–2021	Rank Δ 2019–2021
		Score	Rank	Score	Rank	Score	Rank		
1	Austria	0.899	19	0.883	22	0.943	18	▲ 1	▲ 4
2	Belgium	0.833	22	0.885	21	0.877	23	▼ 1	▼ 2



No	DMU	2013		2019		2021		Rank Δ 2013–2021	Rank Δ 2019–2021
		Score	Rank	Score	Rank	Score	Rank		
3	Bulgaria	0.828	23	0.800	25	0.786	25	▼ 2	—
4	Croatia	1.033	6	1.072	4	1.026	8	▼ 2	▼ 4
5	Czechia	0.940	16	0.888	20	0.898	22	▼ 6	▼ 2
6	Denmark	1.000	8	0.986	11	0.979	13	▼ 5	▼ 2
7	Estonia	1.122	3	1.067	5	1.069	5	▼ 2	—
8	Finland	1.005	7	1.014	7	1.019	9	▼ 2	▼ 2
9	France	0.952	14	0.993	10	0.969	14	—	▼ 4
10	Germany	0.847	21	0.895	18	0.931	20	▲ 1	▼ 2
11	Greece	0.750	25	0.860	23	0.943	17	▲ 8	▲ 6
12	Hungary	0.977	10	0.969	12	0.987	11	▼ 1	▲ 1
13	Ireland	1.063	5	1.062	6	1.053	6	▼ 1	—
14	Italy	0.926	18	0.947	13	0.931	21	▼ 3	▼ 8
15	Latvia	1.338	2	1.255	2	1.171	2	—	—
16	Lithuania	0.963	13	0.932	16	1.170	3	▲ 10	▲ 13
17	Luxembourg	0.815	24	0.930	17	0.958	16	▲ 8	▲ 1
18	Netherlands	0.939	17	0.943	15	1.028	7	▲ 10	▲ 8
19	Poland	0.848	20	0.842	24	0.854	24	▼ 4	—
20	Portugal	1.069	4	1.080	3	1.109	4	—	▼ 1
21	Romania	0.975	11	1.004	8	0.999	10	▲ 1	▼ 2
22	Slovakia	0.972	12	0.944	14	0.959	15	▼ 3	▼ 1
23	Slovenia	0.948	15	0.893	19	0.932	19	▼ 4	—
24	Spain	0.993	9	0.999	9	0.986	12	▼ 3	▼ 3
25	Sweden	1.358	1	1.336	1	1.461	1	—	—

Source: own calculations based on Eurostat (2023).

Table 5. Classification of countries by DEA/BoD efficiency score in 2021

Group	Criterion, 2021 DEA/BoD score	Countries	Interpretation
Efficiency-frontier / super-efficient countries	score > 1.000	Sweden, Latvia, Lithuania, Portugal, Estonia, Ireland, Netherlands, Croatia, Finland	Countries located on or above the estimated frontier
Near-efficient countries	0.950–1.000	Romania, Hungary, Spain, Denmark, France, Slovakia, Luxembourg	Countries close to the frontier, with limited efficiency reserves
Moderate-efficiency countries	0.900–0.949	Austria, Greece, Slovenia, Germany, Italy	Countries with visible but not extreme efficiency reserves
Low-efficiency countries	< 0.900	Czechia, Belgium, Poland, Bulgaria	Countries with the largest relative efficiency gaps

Source: own calculations based on Eurostat (2023).



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The right to strike and its perception by society in the process of digital labour platforms institutionalisation

IZABELA OSTOJ

corresponding author

Department of Economics, Faculty of Economics, University of Economics in Katowice,

1 Maja 50, 40-287 Katowice

✉ izabela.ostoj@ue.katowice.pl

ORCID: 0000-0003-2997-280X

Abstract

Motivation: The article addresses the issue of platform work in Poland in the context of the development of social dialogue institutions and the right to protest. As a result of the implementation of the Directive on improving working conditions in platform work, this relatively new type of work should operate within a new, more coherent institutional environment. In Poland, the widely criticised standards of platform work and strikes undertaken by persons performing platform work have shown that social dialogue has an important role to play in this sector. In European practice, strikes and the resulting social dialogue have strengthened the process of digital labour platforms institutionalisation and accelerated the creation of the Directive.

Aim: The article aims to evaluate the institutional conditions and social climate in Poland in which the right to freedom of association and the resulting right to strike for persons working through digital platforms will be implemented.

Results: The conclusions were formulated based on critical literature review, analysis of legal acts, and data from an original diagnostic survey. The study shows that in Poland, the strike was an important factor that united platform workers and initiated the formation of trade

unions in this sector. As demonstrated, the implementation of the Directive on improving working conditions in platform work should indirectly strengthen its role. Platform workers in Poland can also count on social support in exercising their right to strike, which is a logical consequence of their right to participation in social dialogue.

Keywords: platform workers, trade unions, persons performing platform work, Poland.

JEL: J51; J83; K31.

1. Introduction

Advancing digitisation, platformisation and subsequent fragmentation of work have revealed new areas of concern and problems in the labor market that need to be addressed (Costa & Estanque, 2018, pp. 149–170). One of them is the increasingly common platform work, also referred to as the gig economy (Ostoj, 2020, p. 20; Wheatley, 2024, pp. 1–5). The essence of platform work is the provision of services (online or in the field) coordinated through a specialised digital platform (or digital labour platform – DLP) that enables a quick response to existing demand.

The conditions of platform work, especially for delivery workers operating through platforms using mobile applications, have elicited strong criticism due to the unclear status of workers, who tend to work based on civil law contracts or are self-employed, although they remain significantly dependent on and supervised by the platform, low pay and algorithmic order allocation and performance evaluation, as well as the inability to raise grievances and take joint organised action to protect their own interests (Prassl, 2018, pp. 24–26; Sieker, 2022, pp. 193–207; Au-Yeung et al., 2024, pp. 673–691; Tusińska, 2024, pp. 341–351).

In Poland, the growing conflict between food delivery workers (also known as couriers) and specialised delivery platforms has led to open protests in the form of strikes. It can be assumed that the strikes by delivery workers were triggered by the absence of or deficiencies in the regulations governing this sector of the economy. The situation also occurred in many other European Union countries (Piasna, 2024, pp. 1–15). The problem was recognised at the EU level, which resulted in the draft Directive on improving working conditions in platform work (the so-called Platform Work Directive – PWD), which was created in late 2021. The Directive was finally adopted in October 2024 and published on 11 November 2024, and it represents a step towards building an institutional environment for DLP.

In the PWD, persons performing platform work (including platform workers)¹ are guaranteed, among other things, the right to freedom of as-

¹ The Directive distinguishes between these two categories of persons, limiting the right

sociation, strengthened by the obligation imposed on platforms to facilitate communication between workers in order to create such an opportunity to unionise. The Directive will have to be implemented in the EU countries by 2 December 2026. It is member states that determine how to operationalise the solutions and adapt them to their national institutional infrastructure. The PWD introduces comprehensive regulation, often ahead of national legislation (Piasna, 2024), and intervenes in the most sensitive areas of labor law, such as an employment relationship, algorithmic management, and the right of platform workers to unionise. In this situation, it is important to identify the conditions for exercising the right to freedom of association and to verify to what extent – within the right to unionise – the right to protest, including strike action, can be used by platform workers in Poland. Until now, strike has been the main instrument for defending their interests.

The article aims to evaluate the institutional conditions and social climate in Poland in which the right to freedom of association and the resulting right to strike for persons working through DLP will be implemented. It puts forward arguments to support the thesis that the PWD, by strengthening the right to collective bargaining for persons performing work through platforms, enables the use of strike action as a dispute resolution instrument. This takes place in a favorable social climate.

The article uses critical literature review, analysis of legal acts, and data from an original diagnostic survey. It has the following structure: the part containing the literature review presents the institutional framework for the right to freedom of association and the right to strike in Poland, discusses the participation of persons performing work through platforms in protests, and the right to freedom of association and the right to strike in the context of the PWD. The next part presents the research method and the way of obtaining data characterising the society's attitude towards strikes by persons working through platforms, using the example of food delivery workers. The final part presents the findings of the study, followed by discussion and conclusions.

2. Literature review

2.1. The right to strike in Poland and its perception in society

The workers' right to strike is derived from the right to freedom of association and collective bargaining. The right to form and join workers' organisations is a fundamental workers' right enshrined in the International Labour

to be referred to as 'platform workers' to persons performing work through platforms who are bound to the platform by an employment contract or are in an employment relationship defined by law, collective agreements, or practice, in force in member states (...) (Directive EU, 2024, Art. 2).

Organisation Convention of 1949 (Convention No. 98). It is also included in the European Social Charter and, at the national level, in the Labour Code (Article 18) and the Trade Unions Act. Employers also have the right to freedom of association. Article 2 of the Trade Unions Act of 23 May 1991 (amended in 2018) stipulates that the right to form and join trade unions is granted to persons performing remunerated work, i.e. employees or persons performing work on a basis other than an employment relationship, provided that they do not employ other persons to perform their work and have rights or interests related to the performance of their work that can be represented or defended by a trade union. The Act of 23 May 1991 on the resolution of collective disputes (as further amended) stipulates that all groups of persons performing work who can join trade unions may be covered by a collective dispute. However, if there is no trade union operating in a given organisation, the collective dispute may be conducted by another trade union invited to represent the interests of a given group. If collective bargaining does not produce the expected results, a strike may be undertaken.

A labour strike is a radical form of expressing opposition to the conditions or rules in the workplace. It is a way of exerting pressure by collectively refraining from performing work or providing services to which the strikers are obligated under their legal relationship (Latos-Miłkowska, 2022, pp. 395–405). The purpose of a strike is to resolve a specific problem in a given company. In Poland, the right to strike is granted in Article 59(3) of the Constitution, while the right to organise strikes and other forms of protest is given to trade unions. It has become one of trade union freedoms and, at the same time, the way to conduct a collective dispute within the broader category of collective bargaining (Bocheńska, 2023, pp. 133–147).

The right to strike, which derives from the right to freedom of association, is not limited to employee-employer relations. As Latos-Miłkowska (2022) argues, the consequence of granting the right to form trade unions to persons performing work on a basis other than an employment relationship is that, under the Act on the resolution of collective disputes, these persons may also be a party to such a dispute. This, in turn, also results in the right to participate in a strike referendum and take part in a strike. At the same time, the author points out that this group's right to strike is less protected than that of employees, and that protection against the negative consequences of participating in a strike is also weaker, which may be particularly important in the case of persons performing work through DLPs, whose status on the labour market is ambiguous and who find it difficult to communicate with each other and to unionise in the traditional sense. No less important than the legal conditions is the social perception of how the right to strike is used, as, to varying degrees, society experiences the consequences of this type of protest. It also shapes the climate for workers to assert their rights, which may be more or less favourable.

The attitude of Poles towards strikes was examined by the InterviewMe agency (2022). A total of 1109 respondents took part in a survey on “What do Poles think about strikes in the workplace?” conducted in June 2022. The survey revealed that 43% of the respondents worked in a place where a strike had been considered, 32% thought to join a strike, while 24% had already had such an experience. In the group of respondents over 59 years of age, 34% had participated in a strike, whereas only 16% had done so among young people. According to the respondents, the most frequent reasons for a strike at the workplace were: low wages (64%), poor treatment of employees (64%), and poor working conditions (58%). In the surveyed population, 87% believed that employees should have the right to strike, 78% supported strikes in the workplace as a form of protest, and 61% expressed the conviction that strikes could be effective. The survey also found that 30% of the respondents working under civil law contracts were unaware that they had the right to form and join trade unions and defend their employment and social rights (InterviewMe, 2022). This reveals a picture of a society that broadly supports participation in strikes and perceives them as an effective way to assert workers’ rights, while it is not fully aware of the rights in this regard. In recent years in Poland, strikes have not been a frequently used tool to fight for workers’ rights. In 2021 and 2022 – the pandemic years – 7 and 29 strikes were recorded respectively, involving 1,369 and 3,804 workers. In both 2023 and 2024, the number of strikes stood at 14, though participation varied considerably – 9,260 workers took part in 2023 compared to 1,454 in 2024 (CSO, 2023, p. 217; GUS, 2025, p. 117). The scale of strike activity in any given year appears to depend on the prevailing economic and political circumstances.

2.2. Persons performing work through DLPs in Poland as strike participants

Persons performing work through DLPs constitute a specific group of workers who are not employees within the meaning of the Labour Code. Kozak-Maśnicka and Pisarczyk (2022, pp. 214–215), who studied DLP from a legal perspective, argued that in Poland the interests of workers (including platform workers) are secured neither by statutory standards nor by collective agreements. The law recognising the full trade union rights of a specific category of workers called ‘workers performing remunerated work’ (not only employees) was implemented in Poland on 1 January 2019 (in the Trade Unions Act already mentioned). As Kozak-Maśnicka and Pisarczyk (2022, p. 218) argued, these provisions do not specify either the amount of remuneration or the number of working hours, so persons performing casual work can also be covered by these provisions. Potocka-Sionek and Aloisi (2021, pp. 35–64) pointed out that, as a result of the crisis in collective bargaining in Poland, the possibility of participation in negotiations by persons working

through platforms who do not have employee status is purely theoretical. In such conditions, protest, including strikes, plays a special role as a form of expressing opposition to the existing rules and a way of making claims, and thus of presenting one's position.

In Poland, restaurant meal delivery workers and passenger transport drivers operating through platforms organised protests, even though they did not (at least initially) belong to a trade union. Although it was not impossible in legal terms, and theoretically self-employed persons and contractors can be members of a trade union, fragmented delivery workers operating through platforms were rarely members of trade unions, as initially there were no such organisations in this sector, and platform workers themselves did not necessarily see the need to participate in such organisations. The most publicised cases were those of negotiations and protests involving food delivery workers. For example, in April 2021, there was a wave of strikes by Glovo couriers against unfavourable changes in rates and the service billing system. In the case of the Pyszne.pl platform, a trade union of persons working through the platform was established in October 2022, and from that moment on, the interests of couriers were represented by the Inter-Company Organisation OPZZ Confederation of Labour, which conducted negotiations with the platform. Strikes were also organised in a number of cities in Poland: in Gliwice, Radom, and Rzeszów on 19 December 2022, in Kraków, Poznań, Gdynia, Bydgoszcz, and Warsaw on 3 February 2023, and in Poznań, Gdańsk, and Białystok on 21 March 2024. The strikes were enabled through communication afforded by social media and involved couriers not reporting their availability for work and participating in pickets with banners, as reported by Zentrale – a courier cooperative promoting workers' rights (Zentrale). The typical response of the platforms to the couriers' protests was to deactivate their accounts on the platform and recruit new courier candidates.

The courier strikes in Poland preceded the formation of the Couriers' Trade Union, which took place in Poznań on 13 April 2024. It represents couriers working through DLP across Poland. Its establishment was a direct consequence of the subsequent two-day strike by Glovo couriers in Poznań and the actions taken by Zentrale. Thus, the order of events was reversed (the protest preceded the formation of the trade union), which revealed the lack of institutional infrastructure at DLPs. According to Vandaele (2024a, pp. 30–32), app-based food delivery platforms are not only a symbolic industry in the platform economy, but it can also serve as an educational space for trade unions to develop organisational strategies in other industries affected by algorithmic management or non-standard work organisation, often by engaging young (including migrant) workers. Vandaele (2024b, pp. 93–100), in his cross-European study, sees the emergence of trade unions in this sector as a kind of experiment in which micro-syndicalism - in the form of new trade unions bringing together platform workers - clashes with traditional

macro-syndicalism, which experiences the pressure of the non-standard organisation emerging in the DLP.

2.3. The right to freedom of association in the context of the Directive on improving working conditions in platform work and its consequences

Literature provides examples of various forms of protest from around the world involving persons working through DLPs – strikes, log-offs, demonstrations, and institutionalisation legal actions on various work platforms across the world. These could be classified as social movement unionism (Moares & Nuez, 2023, pp. 1–7) due to the nature of the actions, which differed from those of traditional trade unions. The protests mainly concerned: platform worker status, algorithmic management, worker grievances about pay, and general working conditions, which reflected the insufficient institutionalisation of platform work. A study conducted by the European Trade Union Institute showed that – in EU countries – trade union membership among platform workers is similar to that of the population working outside the platform sector, averaging approx. 13%, but it is lower among food delivery couriers, amounting to approx. 7% (Vandaele, Piasna & Zwysen, 2024, p. 21). In Europe, in the years 2015–2020, most protests were connected with pay or employment status (Bessa *et al.*, 2022, pp. 7–8, 25; Joyce *et al.*, 2020, pp. 4–5). Due to the fact that the institutional power of platform workers was perceived as very low (Boavida *et al.* 2022, pp. 52–53; Tassinari & Maccarone, 2017, pp. 353–357; Cini & Tassinari, 2023; Joyce, Stuart & Ford, 2022), the possibility of the most appropriate response to these problems by EU institutions and individual member states was discussed.

The preparation of the draft Directive on improving working conditions in platform work in 2021, followed by its adoption in October 2024, can be seen as the consequence of a dispute concerning the need for separate regulations for DLP (Potocka-Sionek, Aloisi, 2021, pp. 35–64; Carelli, Oliveira & Grillo, 2022, pp. 29–53; Ostoj, 2023, pp. 143–155). One aspect of improving platform work conditions is granting the right to freedom of association, which is directly linked to the right to participate in collective labour disputes and the right to protest.

In accordance with Directive 2024/2831 (Art. 20), DLP are obliged to provide communication channels using the digital infrastructure of the platform for persons performing platform work, including the existence of private and secure mutual communication channels and mutual contact with representatives of persons performing work through the platform. Furthermore, it was stipulated that platforms should refrain from accessing or monitoring these contacts and communication processes. Article 25 lays down that member

states should take appropriate measures to promote the role of social partners and encourage the use of the right to collective bargaining, including in relation to determining the correct employment status and rights related to the use of algorithmic management, which are key issues for platform work.

Additionally, pursuant to the Directive, representatives of persons performing platform work have the right to participate in the assessment of how effectively automated monitoring and decision-making systems with related procedures work, performing the role traditionally assigned to trade unions. Therefore, it can be inferred that the regulation takes into account the complexity of associating persons performing platform work into typical trade unions and proposes this type of solution.

The PWD defined ‘workers’ representatives,’ which can be trade unions or persons freely chosen by platform workers, in accordance with national legislation and practice. It also defined ‘representatives of persons performing platform work’ as including representatives of employees and – to the extent provided for by national legislation and practice – representatives of persons performing work through platforms other than platform employees, granting representatives a broader range of powers.

As a result, despite the complexity and ambiguity of the situation of persons providing services through platforms, the PWD is an attempt to bring their rights closer to those granted to employees. Communication channels among workers, including their representatives, should, despite the absence of a common workplace, facilitate mutual acquaintance, the exchange of views, and the development of positions for negotiations with DLPs. It can be assumed that this might lead to the formation of a trade union or a similar organisation, as well as result in holding protests in various forms, including strikes.

Due to the implementation of the Directive and the need to develop social dialogue, it is important to study and understand the attitude of Polish society towards protests by platform workers and the climate in which the future implementation of the PWD provisions will take place, the logical consequence of which is that persons working through platforms are granted the right to freedom of association, the right to participation in collective bargaining, and, in consequence, the right to strike.

Public attitudes toward strikes by platform workers also inform the development of informal institutions that reflect the extent of social solidarity with workers who lack employee status. Public support for strikers could potentially influence the scale of use of such services and, for example, lead to boycotts. It may also stimulate a willingness to engage in social dialogue regarding the scope of platform workers’ rights in connection with the implementation of the Directive, and, in the future, influence their enforcement. It also contributes to the social debate concerning sustainable development goals in the context of decent work.

3. Methods

In order to examine society's attitudes toward protests by persons working through DLPs, a diagnostic survey was designed using an online questionnaire. The survey concerned food delivery services, which were chosen as a representative example. The survey was commissioned to Biostat, an agency with access to an appropriate research panel. The survey population was limited to city residents, as meal delivery services ordered and coordinated via digital platforms are only available there. It was important to reach respondents who had at least encountered this type of service, as it can be observed on city streets, but not necessarily used by them. The determination of the research sample assumed the fraction of 0.5 with a maximum error of 5%. The survey was conducted on 5-7 December 2023, which coincided with the discussions on the final draft of the PWD. The survey aimed to assess the social climate of institutional change, as it was conducted during a period of intensifying protests by couriers.

The survey covered adult city residents (aged 18 to 70). The sample was calculated at 401 respondents and was representative in terms of gender, age, and city of residence (Table 1). Quota sampling was used.

The sample included 43.6% of respondents with higher education, 25.9% with post-secondary or secondary vocational education, 17.7% with general secondary education, 11% with basic vocational education, and 1.7% with lower secondary education. The response rate was approximately 33%; questionnaires were selected based on the criterion of representativeness.

In terms of actual use of food delivery services, over 40% of respondents ordered meals or groceries at least several times a month. However, as many as 81.3% had contact with this type of service. The frequency of ordering such services was not linked to a statistically significant difference based on gender, but it did vary significantly based on age. In the case of meal delivery ($p=0.0004$), the highest percentage of respondents using the service very often or often was reported in the youngest age group (60%), in contrast to the oldest group where it was approx. 24%. Regardless of this difference, the assumption that these services were very popular was confirmed.

4. Results

In the survey, respondents expressed opinions on a five-point Likert scale ranging from 1 – strongly disagree, 2 – somewhat disagree, 3 – difficult to say, 4 – somewhat agree, to 5 – strongly agree. The analysis did not reveal statistically significant differences in responses based on gender, age, or city size, so the article presents the results for the total population.

First, respondents were presented with the issue and reminded that couriers delivering meals ordered through special platforms (their mobile apps or websites) were on strike against low pay rates and AI-based order management. The question was whether they considered these protests justified. The structure of the responses is presented in Chart 1.

The vast majority of respondents, almost 65%, considered the couriers' strikes that took place in Poland to be justified, with only 8% holding the opposite opinion. Thus, society responded positively to the couriers' actions in defense of their interests. Further in the survey, a more general question was asked: should food delivery couriers have the right to strike, similarly to other workers? Although this right is granted in the Constitution, it is explicitly linked to trade unions, which were not initially formed by persons working through DLPs, who relied on the support of other organisations. The question referred to the issue of the status of persons performing work through platforms, who are usually employed under the contract of mandate in Poland. The structure of the responses is presented in Chart 2.

An even higher percentage, almost 73%, admitted that couriers working through platforms should have the right to protest similarly to other workers, although this percentage was lower than the one obtained in the InterviewMe survey (2022), in which 87% supported workers' right to strike. Less than 7% were opposed, while about 1/5 of respondents did not have a specific opinion. These data are an important signal indicating that respondents interpret the facts in favor of treating platform workers as employees, including the rights to which they are entitled. This is also closely related to the European-wide discussion on the status of persons performing work through platforms (Bessa et al., 2022, pp. 7–8, 25; Joyce et al., 2020, pp. 4–5; Ostoj, 2023, pp. 143–155).

The next question expanded on the one concerning platform workers' right to strike and, in a way, verified the respondents' attitudes. It addressed the problem of discomfort experienced by customers, i.e. persons ordering food, which is associated with couriers' protests (Chart 3).

Respondents were more divided on this issue, although almost half disagreed with the statement, while about 1/3 had no opinion. Slightly more than 17% admitted that couriers should not protest because it constituted a problem for customers. This shows that, despite widespread acceptance of the right to protest and support for workplace strikes as a form of protest (78% in the InterviewMe survey, 2022), society is less supportive of this method of promoting the rights of platform workers when the attention is drawn to the discomfort that may be associated with it for the public. In this case, informal institutions clearly do not ensure solidarity with the strikers.

Therefore, legislation that would sanction the effective participation of platform workers in collective bargaining and the resulting right to protest, including strikes, appears to be necessary. The same applies to raising awareness in the area of working conditions in platform work.

5. Conclusion

Changes in the rules governing the engagement of labour began to accelerate further driven by technological advancements, particularly the development of DLPs. In the platform work sector, the employment relationship has virtually disappeared and civil law contracts and dependent self-employment (so-called bogus self-employment), not present in Polish law, have become widespread.

In Poland, as in other countries, strikes became a factor consolidating workers engaged through different DLPs. They preceded the formation of trade unions in this sector and were an important step towards the institutionalisation of DLPs. The process appears to be analogous to the emergence of labor law and workers' organisations in conditions of precarious employment in the 19th century, as argued by Joyce *et al.* (2022). It also underscores the weakness of the existing institutional infrastructure, whose incorporation of platform work is taking place in an atmosphere of conflict. In such a situation, society's attitude towards the protests of persons performing work through platforms can serve as an informal norm of social solidarity, supporting the difficult process of DLP institutionalisation. Simultaneously, the PWD implementation, taking into account the extension of the right to collective bargaining to representatives of persons performing work through platforms, appears to be necessary for the effective support of national solutions in the process of building institutions for DLPs. It can also be anticipated that new trade unions in the DLP sector and the stronger role of representatives of persons performing work through platforms will contribute to a revision of how labour issues, including non-standard labour, are approached from the perspective of trade union tradition and will cause this tradition to go beyond the framework of typical employee relations.

The study also has certain limitations. It was conducted as a one-time survey and focused on a single, albeit well-known, group of platform workers and a popular service. We cannot therefore be certain whether similar results would be obtained for other groups or in a survey conducted at a different time. Future research should focus on observing the activities of trade unions representing platform workers and their role following the implementation of the PWD, as well as their potential impact on further changes in labour law – changes that prevent precariousness while taking into account the impact of technological progress. The widespread use of DLP services creates a unique opportunity to observe and study informal labour market institutions and, in particular, the public awareness of how they operate and the working conditions of platform workers.

References

- Au-Yeung, T. C., Chan, C. K.-C., Ming, C. K. K., Tsui, W. Y. A. (2025). The gig economy, platform work, and social policy: food delivery workers' occupational welfare dilemma in Hong Kong. *Journal of Social Policy*, 54(2) 673–691. doi:10.1017/S0047279423000673.
- Bessa, I., Joyce, S., Neuman, D., Stuart, M., Trappman, V., Umney, C. (2022). *A global analysis of worker protest in digital labour platforms*. ILO Working Paper 70, Geneva.
- Boavida, N., Brandao, A., Naumann, R., Roque, I., Azevedo, R. (2021). Case studies on the digital labour platforms in Portugal: Final National Report of Project CrowdWork. European Commission, Universidade Nova de Lisboa, CICS Nova.
- Bocheńska, A. (2023). Kilka uwag o prawie do strajku. *Prawo i Więzy*, 2, 133–147. <https://doi.org/10.36128/10.36128/PRIW.V145.688>.
- Carelli, M., Oliveira, R., Grillo, S. (2021). Concept and criticism of digital labour platforms. *Labour & Law Issues*, 7(1), 29–53. <https://doi.org/10.6092/issn.2421-2695/13110>.
- Cini, L., Tassinari, A. (2023). Trade unions in the gig economy. In David A. Snow (Ed.), *The Wiley Blackwell Encyclopedia of Social and Political Movements*, Chicester: Wiley-Blackwell. <https://doi.org/10.1002/9780470674871.wbespm646>.
- Costa, H. A., Estanque E. (2018). Trade unions and the social movements on the crossroads. A Portuguese view. In: Social movements and organized labour. Passions and interests. Grote J. R., Wagemann C., (Eds.) Routledge, pp. 149–170.
- Directive (EU) of the European Parliament and the Council of 23 October 2024 on improving working conditions in platform work (OJ L2831/24). InterviewMe. <https://interviewme.pl/blog/strajk-w-pracy-badanie> (access: 11.11.2024).
- Joyce, S., Neumann, D., Trappman V., Umney, Ch. (2020). *A global struggle: worker protest in the platform economy*. ETUI Policy Brief, European Economic, Employment and Policy, No 2.
- Joyce, S., Stuart M., Ford Ch. (2022). Theorising labour unrest and trade unionism in the platform economy. *New Technology, Work and Employment*, 38(1), 21–40. <https://doi.org/10.1111/ntwe.12252>.
- Kozak-Maśnicka, M, Pisarczyk, Ł. (2022). Extending the personal scope of collective bargaining as a chance of gig workers? The Polish case. In J. M. M. Boto & E. Brameshuber (Eds.) *Collective bargaining and the gig economy. A traditional tool for new business models* (pp. 211–226). Hart Publishing, Oxford–London–New York–New Delhi–Sydney. doi: [10.5040/9781509956227.ch-013](https://doi.org/10.5040/9781509956227.ch-013).
- Latos-Miłkowska, M. (2022). Status prawny osób świadczących pracę na innej podstawie niż stosunek pracy w świetle ustawy o rozwiązywaniu

- sporów zbiorowych. *Studia z Zakresu Prawa Pracy i Polityki Społecznej*, 29(4), 395–405. <https://doi.org/10.4467/25444654SPP.22.033.16578>.
- Moares, F. F.-T., Nuez, G. B. (2023). The mobilisation of food delivery gig economy workers (riders). *Capital & Class*, 47(3), 1–7. <https://doi.org/10.1177/03098168221131687>.
- Ostoj, I. (2020). *Praca w czasach cyfrowych platform technologicznych. W sieci gig economy*. Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, Katowice.
- Ostoj, I. (2023). Institutions for digital labour platforms. Results of a study conducted in Poland. *Ekonomia i Prawo. Economics and Law*, 22(1), 143–155.
- Piasna, A. (2024). Digital labour platforms and social dialogue at EU level: How new players redefine actors and their roles and what this means for collective bargaining. *Social Policy and Administration*, 58(4), 1–15. <https://doi.org/10.1111/spol.13000>
- Potocka-Sionek, N., Aloisi, A. (2021). ‘Festina Lente’: The ILO and EU Agendas on the digital transformation of work. *International Journal of Comparative Labour Law and Industrial Relations*, 37(1), 35–64. <https://doi.org/10.54648/ijcl2021002>.
- Prassl J. (2018). *Humans as a service. The promise and perils of work in the gig economy*. Oxford University Press.
- CSO (2023). *Yearbook of Labour Statistics 2023*. Central Statistical Office, Poland, Warsaw.
- CSO (2025). *Yearbook of Labour Statistics 2025*. Central Statistical Office, Poland, Warsaw.
- Sieker, F. (2022). Platform work and access to social protection across major European countries. *Journal of International and Comparative Social Policy*, 38(3), 193–207. <https://doi.org/10.1017/ics.2022.13>.
- Tassinari, A., Maccarrone, V. (2017). The Mobilisation of gig economy couriers in Italy: some lessons for the trade union movement. *Transfer: European Review of Labour and Research*, 23(3), 353–357. <https://doi.org/10.1177/1024258917713846>.
- Tusińska M. (2024). Digital platforms as boosters of the secondary labour market? Polish perspectives on couriers and drivers. *Scientific Papers of Silesian University of Technology, Organization and Management Series*, 201, 341–351. <http://dx.doi.org/10.29119/1641-3466.2024.201.26>.
- Vandaele, K. (2024a). *Inevitable, vulnerable, unprofitable: inquiry into food delivery platforms in Europe*. Future of Work Series. Working Paper 2024.10, ETUI, Brussels.
- Vandaele, K. (2024b). When ‘micro-syndicalism’ meets ‘macro-syndicalism’, Emergent and deliberative experimentation enriching union strategies towards app-based food delivery couriers in Belgium. In M. Laroche & G. Murray (Eds.), *Experimenting for union renewal: challenges, illustrations and lessons* (pp. 93–100), ETUI, Brussels.

- Vandaele, K., Piasna, A., Zwysen, W. (2024). *Are platform workers willing to unionize? Exploring survey evidence from 14 European countries*. ILO Working Paper 106, Geneva.
- Wheatley, M. C. (2024). Redefining work: the gig economy's impact on work and life. *Premier Journal of Business and Management*, 1, 1-5. <https://doi.org/10.70389/PJBM.100005>.
- Zentrale, Retrived 1.01.2025. <https://zentrale.pl/category/protesty-w-polsce-i-na-swiecie/>.

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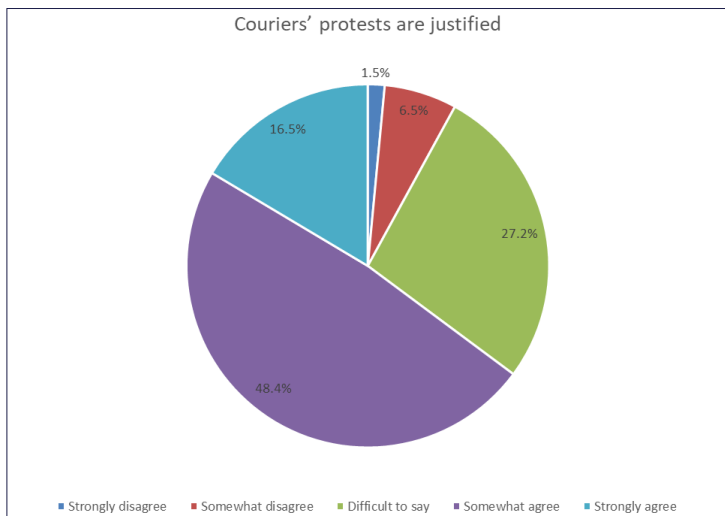
Appendix

Table 1. Structure of respondents (N=401)

Characteristic	Number	%
Gender		
Female	205	51.1
Male	196	48.9
Age		
18–24	38	9,5
25–34	76	19.0
35–54	167	41.6
55–70	120	29.9
City of residence		
City up to 50,000 residents	210	52.4
City above 50,000 residents	191	47.6

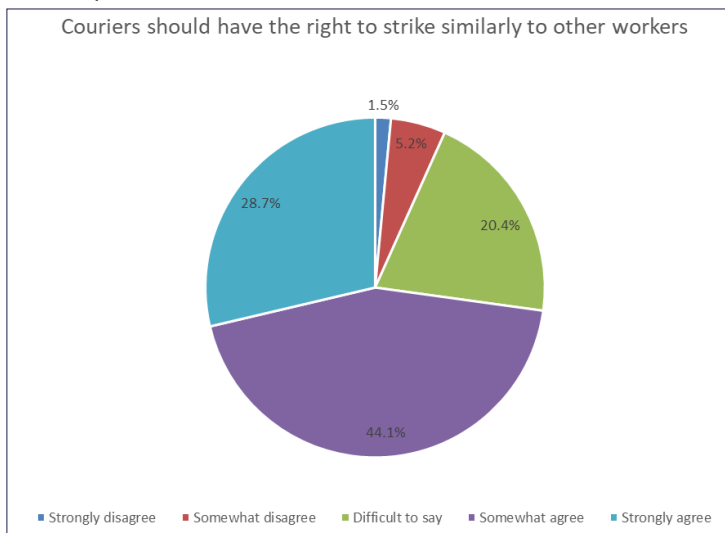
Source: Own preparation based on Author's research.

Chart 1. Structure of responses to the question of whether the couriers' protests were justified



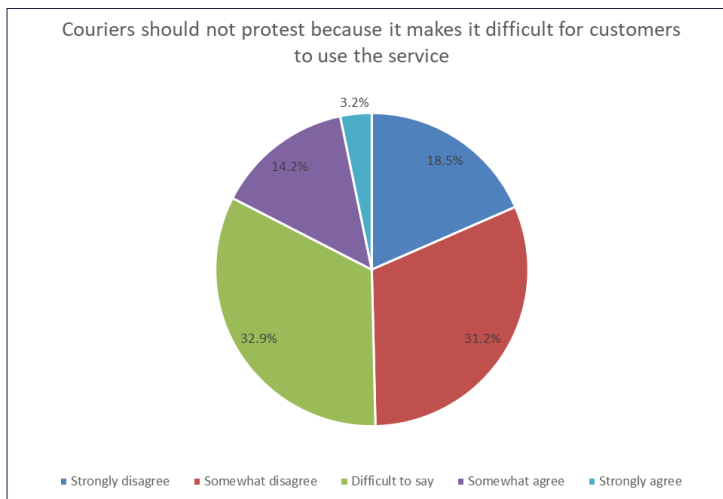
Source: Own preparation based on Author's research.

Chart 2. Structure of responses to the question of whether couriers should have the right to strike similarly to other workers



Source: Own preparation based on Author's research.

Chart 3. Structure of responses to the question: Do you agree with the statement that couriers should not protest because it makes it difficult for customers to use the service?



Source: Own preparation based.



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The Concept of Autogenic Institutional Change in the Light of the Activities of the Constitutional Tribunal

JAKUB SUKIENNIK

corresponding author

Wroclaw University of Economics and Business, Faculty of Finance and Economics, Department of Economics and Institutional Economics, ul. Komandorska 118/120, 53-345 Wrocław, Poland

✉ jakub.sukiennik@ue.wroc.pl

 ORCID: 0000-0002-1289-7009

SŁAWOMIR CZETWERTYŃSKI

Wroclaw University of Economics and Business, Faculty of Finance and Economics, Department of Economics and Institutional Economics, ul. Komandorska 118/120, 53-345 Wrocław, Poland

✉ slawomir.czetwertynski@ue.wroc.pl

 ORCID: 0000-0003-4078-0104

Abstract

Motivation: Theories of institutional change may be divided into three principal groups: (1) evolutionary theories, (2) theories of collective choice, and (3) the autogenic theory of institutional change. The autogenic theory occupies a distinctive position among them. It describes mechanisms of institutional change that differ both from the spontaneity of evolutionary approaches and from the intentionality characteristic of political or group-based choice. The changes that fall within its analytical scope are not random; rather, they are purposeful and oriented toward improving the functioning of the institutional system within a given domain. At the same time, they are independent, since their initiation does not require the involvement of interest groups. In fact, the initiation of change is embedded in the

rules governing the functioning of the institutional system itself. This pertains to the system's protective mechanisms, whose empirical manifestation is the activity of the Constitutional Tribunal. The specificity of the autogenic theory of institutional change, which makes it possible to closely trace the process of institutional transformation, invites reflection on its epistemic capacities, understood here in terms of the adequacy of explanation and the predictive power of economic phenomena based on a given scientific theory.

Aim: The aim of this article is to demonstrate the epistemic capacities of the autogenic theory of institutional change in the study of institutional transformation within the institutional system. This objective will be pursued by seeking an answer to the research question: which factors characteristic of the autogenic theory of institutional change account for its epistemic capacities in explaining institutional changes within the institutional system?

Results: Through the examination of the autogenic theory of institutional change, both in a hypothetico-deductive framework and in an empirical perspective, it has been possible to identify the features that constitute its essential epistemic capacities. These factors are: (1) formalization, (2) hermeticity within the research domain, namely the institutional system, and (3) the interpretability of mechanisms of constitutional review, which are grounded in the activities of the Constitutional Tribunal. The analysis has also revealed the epistemic limitations of the autogenic theory of institutional change, manifested in its ability to explain only a portion of legislative processes. This implies that the theory applies to a relatively small subset of the totality of legal changes.

Keywords: autogenic theory of institutional change; institutional system; legal system; formal institutions; institutional change.

JEL: K10; B52; K40

1. Introduction

Economics, as a social science, is commonly regarded as a Multiple Paradigm Science (Czetwertyński, 2023; Dequech, 2007; Kozyr-Kowalski, 2000; Ritzer, 1975). More generally, the social sciences, according to the author of the theory of scientific revolutions, have never attained the status of a science precisely because of the lack of consensus among scholars and, consequently, the failure to establish a single paradigm (Kuhn, 1962). Regardless of the validity of Kuhn's judgment concerning the scientific status of what is commonly referred to as the "social sciences" (Chalmers, 1999), there is no doubt that economics is internally diversified, both at the descriptive and at the normative level (Keynes, 1891). Economics is not only characterized by a general diversification that can be reduced, for instance, to the distinction between orthodoxy and heterodoxy (Demsetz, 2008; Kundera, 2014), but also by a more specific diversification within highly specialized currents of thought.

The situation is no different in the case of institutionalism, within which one may distinguish a number of theories that only seemingly constitute

a solid paradigm, but in fact represent distinct scientific research programmes (in Lakatos's sense (1978)). These programmes may share certain assumptions, while at the same time containing elements that are mutually exclusive. The absence of a single established paradigm need not be considered a weakness of the social sciences, including economics. On the contrary, it allows for a continuous search for theories and research methods better suited to explaining particular phenomena. Blind adherence to a single paradigm does not constitute a scholarly virtue, as Kuhn (1962) himself demonstrates by pointing to the role of the accumulation of anomalies in the process of scientific revolutions. Similarly, Lakatos (1978) emphasizes the vitality of scientific research programmes, while Feyerabend (1975), in his maxim "anything goes," expresses the pluralism of methods and their unconstrained selection free from the social regime of the academic environment (Motycka, 1980).

This article addresses a segment of the universe of economic sciences by focusing on a set of theories within institutionalism. Specifically, it concentrates on the autogenic theory of institutional change. The aim of the article is to demonstrate its epistemic capacities in the study of institutional change within the institutional system. It should be noted that the choice of the autogenic theory of institutional change as the object of the analysis of epistemic usefulness is linked to the limitation of the analysis to changes within formal institutions. This is a significant narrowing of scope, which makes it possible to highlight the importance of maintaining eclecticism in science (Sulkowski, 2012), particularly in the field of institutional economics. The aim of the article will be pursued by seeking an answer to the research question: which factors characteristic of the autogenic theory of institutional change account for its epistemic capacities in explaining institutional changes within the institutional system? The answer to this question, in turn, serves as a basis for determining the limitations of the autogenic theory of institutional change.

Attempting to answer the research question posed in this article requires situating the autogenic theory within the broader set of theories of institutional change. However, before addressing the substantive core of the research question, two clarifications must be made. First, it is necessary to specify what is meant by the epistemic capacity of a given theory. This requires certain methodological decisions, since the issue of knowledge is inherently contentious within epistemology. It is also necessary to define the institutional system, which is essentially a matter of clarifying the discourse. For the purposes of this article, the institutional system is understood as a combination of formal institutions that create a network of interrelations among streams of action in the economy. Accordingly, the research area in this article is limited to institutional changes within the institutional system.

1.1. Remarks on the Epistemic Capacity of Scientific Theories

The epistemic capacity of a given theory may be derived from the classical concept of truth introduced by Aristotle, according to which there must be correspondence between judgments and the actual state of affairs. Contemporary economic thought is grounded in a relatively simple understanding of the research domain. Hardt (2013) explicitly emphasizes that the ontological layer of economics, as a science, contains a realist postulate. This amounts to the claim that reality exists independently of the researcher and can, within certain limits, be known. In Nowak (1977), realism corresponds to the postulates of materialism and causality, which reduce the research domain of economics to material (physical) factors that interact causally. Nowak's interpretation implies nothing more than that the world observed by the economist is confined to knowable reality (albeit not fully), and therefore excludes everything metaphysical. The consequence of such a delineation of the research domain, in the context of epistemic capacities, is the possibility of explaining and predicting human decisions regarding the allocation of scarce resources to alternative ends by means of economic theories (Blaug, 1992; Robbins, 1932). Epistemic capacity can thus be reduced to the adequacy of explanation and prediction of economic phenomena. Moreover, in economics it is characteristic that counterfactual assumptions are permissible in economic theories, as long as they adequately explain and predict phenomena (Friedman, 1953) – hence the continued primacy of the model of homo oeconomicus in neoclassical economics. The main problem of assessing the adequacy of a given theory, and thus its actual epistemic capacities, lies in the criterion that makes such an assessment possible. Constructivists have demonstrated that the criterion of theory evaluation is contained within the theory itself (Scheuer, 2015), which may ultimately lead to tautology. This is characteristic of Becker's (1976) economic approach, in which the assumption of utility maximization implies tautological explanations of decisions. Simplifying, every choice made (i.e., one that has already been taken) must have been the consequence of the decision-maker's economic calculus, weighing costs and benefits so as to maximize net advantage. Thus, every choice, even seemingly irrational ones, can be explained by assuming that the decision-maker assigns particular cost and benefit values to the set of variables underlying the decision. From the standpoint of the theory itself, this is valid, and the theory evidently possesses excellent explanatory capacity—at least with respect to explaining decisions already made. Yet, its practical application reveals that individuals need not have made their choices on the basis of cost–benefit calculations, even in the context of firm behavior (Hall & Hitch, 1939). Accordingly, the capacity to predict human actions through the economic approach is limited, as behavioral economists

clearly emphasize (Kahneman, 2012; Thaler, 2018). Blaug (1992), in defense of neoclassical economics, points out that it still retains explanatory potential, though he himself cannot precisely specify its effectiveness. Hence, it does have epistemic capacity, but its exact determination is not possible.

The foregoing considerations are not intended to suggest that it is impossible to determine the epistemic capacity of a given theory, but rather to highlight the difficulty of defining the criterion and subjecting the theory to assessment. In the case of theories with a high degree of generalization, where some variables must be eliminated and thus subjected to isolation by abstraction (Lange, 1978), it is difficult to grasp a clear evaluative criterion of concrete value. This results, among other things, from the fact that some of the variables influencing human decisions are not quantifiable, or researchers are unable to measure them. In such cases, the epistemic capacity of a given theory remains underdetermined. It is otherwise, however, in the case of theories referring to a research domain that can be quantified without the necessity of introducing counterfactual assumptions. This means that judgments derived from the theory can be directly compared with reality, without the need to account for counterfactual assumptions. In economics, however, such theories will be highly specific, explaining particular aspects of human action rather than providing a comprehensive picture of the economy.

1.2. Methodological Approach

The foregoing considerations on the epistemic capacity of scientific theory have revealed two levels of knowledge. This was particularly evident in the example of Becker's (1976) economic approach. His theory demonstrated excellent epistemic capacity in the deductive perspective, as could be shown by the theorem of a hypothetical cost–benefit calculus. In the empirical perspective, however, the epistemic capacity of his theory is imperfect, since individuals do not always act in accordance with the assumption of maximizing economic outcomes. Hence, the values attributed to variables may be inaccurate, which in some cases can even be demonstrated experimentally (for instance, the problem of sunk costs, which should not be taken into account in decision-making but are, in fact, considered by individuals [Thaler, 2018]).

Accordingly, the epistemic capacity of a scientific theory can be examined from two perspectives: (1) the hypothetico-deductive and (2) the empirical. In the hypothetico-deductive perspective, the study of a scientific theory consists in moving within the framework of the assumptions of the given theory and the conclusions that can be logically derived from them. Epistemic capacity in this perspective will be reflected in the determinism of reasoning, that is, in the unambiguous logical transition from assumptions to results. By contrast, the empirical perspective consists in comparing the predicted outcomes of reasoning concerning the actual values of variables

with their factual state—that is, the correspondence of judgments with the actual state of affairs.

Within this dual research framework, the present article applies the hypothetico-deductive method to determine whether, given the assumptions of the autogenic theory of institutional change, the resulting conclusions are deterministic under conditions of logical reasoning. To assess the correspondence with the actual state of affairs, the method of quantitative categorization of textual material was employed.

2. The Epistemic Capacity of the Autogenic Theory of Institutional Change in the Hypothetico-Deductive Approach

The literature indicates that institutional change can take various forms and result from different mechanisms. Consequently, distinct theories of change have been formulated, which may be divided into three principal groups: (1) evolutionary theories, (2) theories of collective choice, and (3) the autogenic theory of institutional change. This division, however, entails a form of unification, in that within each group various authors have formulated more specific theories (Sukiennik, Czetwertyński, Brol, 2025). **The study of institutional change rests on a substantial body of theoretical and empirical work. Foundational contributions established institutions as the rules that structure economic and social interaction and clarified their causal weight in shaping economic performance (Hodgson, 2006; North, 1990). Building on this foundation, scholars have developed typologies of institutional transformation that go beyond the dichotomy of stability and rupture, identifying gradual modes of change such as displacement, layering, drift, conversion, and exhaustion (Mahoney & Thelen, 2010; Streeck & Thelen, 2005). Comparative reviews have further mapped the diversity of explanatory frameworks, grouping them according to the mechanisms by which institutions arise and evolve (Kingston & Caballero, 2009). It should be emphasized that institutional change is often influenced by multiple interrelated factors, reflecting its inherently multifactorial nature. This multifaceted perspective is also reflected in studies of legal-institutional change, which highlight how internal systemic logic and external pressures jointly shape the evolution of legal institutions and the formation of legal sources (Leszczyński, 2023; Pejovich, 1999).**

In evolutionary theories, the dominant feature is the spontaneous and unintended character of institutional change. Institutions evolve through gradual adaptation to new social and technological conditions, accompanied by a mechanism analogous to natural selection. This means that some

arrangements persist while others disappear, often independently of the will of particular actors.

By contrast, theories grounded in the idea of collective choice emphasize the role of intentional actions. In this perspective, institutional changes are the result of deliberate decisions made through negotiation and competition among interest groups. Change is thus an end in itself, with its direction and scope depending on the balance of socio-political forces and the capacity of particular actors to influence the legislator.

Among these groups of theories of institutional change, a distinctive position is occupied by the autogenic theory of institutional change, which describes mechanisms differing both from the spontaneity of evolutionary approaches and from the intentionality of political or group choice. Changes of this type are not random; they are purposeful and directed toward improving the functioning of the institutional system within a given domain. At the same time, they are independent, since their initiation does not require the involvement of interest groups—that is, they arise spontaneously from within the logic of the institutional system itself. This theory approaches the institutional system analogously to a closed physical system, in which the actions of actors are determined by universal laws. Its importance lies in the assumption that autogenic and independent actions occur simultaneously, while at the same time being shaped by the purposeful activity of actors operating within the institutional system. The system itself emerges from the interplay and interpenetration of formal and informal institutions. It operates on two levels: (1) first-order principles and (2) second-order principles. First-order principles define the laws governing the functioning of the institutional system itself. In fact, these are enacted legal provisions that impose constraints on its functioning with the aim of ensuring its proper operation. Their analogy to physical laws lies in their universality and relative immutability. The immutability, however, is conventional, as there are instruments for changing them, although these require extraordinary measures that go beyond the normal functioning of the system (e.g., revolution, systemic transformation, or constitutional amendments). For example, in Poland, the 1997 Constitution has been amended only once, in 2006, to align national law with the EU Council Decision of 13 June 2002. In other words, first-order changes are relatively rare, complex, and far-reaching. What the analogy with physical laws does not cover is that first-order principles are in fact established deliberately, rather than emerging spontaneously (they are rationally constructed). This, however, lies outside the theoretical framework of the autogenic theory of institutional change and is treated as a baseline condition.

This distinctiveness warrants explicit demarcation from the two adjacent theoretical frameworks. Although the applicants who initiate constitutional review may superficially resemble interest groups in the public-choice sense,

the analytical centre of gravity differs fundamentally: in public-choice accounts, the outcome of institutional change reflects the bargaining power and political resources of contending groups, whereas in the autogenic account it is determined by the formalized procedures of the institutional system itself, which apply uniformly irrespective of the applicant's standing or political weight. Identical motions may be dismissed or upheld depending solely on their conformity with first-order principles, not on the negotiating capacity of those filing them. Equally, autogenic change should not be conflated with the legalistic practice of harmonizing legal acts familiar to legal scholars; rather, it constitutes a theorization of that practice within institutional economics, situating it within a hierarchy of first- and second-order principles and treating institutional adjustment as an endogenous mechanism rather than a sequence of ad hoc legislative responses. The autogenic perspective is also distinct from the evolutionary one: while the latter emphasizes spontaneity and unintended adaptation, autogenic change is purposeful, with its directionality embedded in deliberately formulated first-order principles. The element of spontaneity, where present, pertains only to the triggering of change, not to the mechanism through which it unfolds. The autogenic theory thus occupies its own analytical niche, complementing rather than duplicating the explanatory work of the other two frameworks.

By contrast, at the second-order level, institutions are created or modified within the institutional system according to the first-order principles. Returning again to the case of Poland, this legal system has established special procedures for law-making, as well as for reviewing and even excluding institutions inconsistent with the first-order principles (Czetwertyński, Sukienik, 2023). For instance, the Constitutional Tribunal, pursuant to Article 188 of the Constitution, conducts hierarchical review of the conformity of formal institutions. Its role, legitimized by first-order principles (the Constitution of the Republic of Poland), consists in derogating (removing) lower-order formal institutions inconsistent with higher-order ones (Czetwertyński et al., 2021).

The interpenetration of these two levels thus generates spontaneous changes within the institutional system, which may be called autogenic. This is a case in which changes to particular institutions introduced into the system may trigger further changes, as a consequence of the operation of first-order principles (independent of the initiators of second-order changes). In this respect, institutional change is not driven by elements found in evolutionary theories, nor by those emphasized in theories of collective choice (Sukiennik, Czetwertyński, Brol, 2025). Rather, it is autogenic, derivative of the principles governing the institutional system (first-order principles), and expressed, for instance, in mechanisms safeguarding the system against lack of harmonization or even against institutional competition within the system as a whole.

In this approach to institutional change, there emerges a combination of self-generating changes (autogenic) that result from deliberately formulated first-order principles, together with the purposeful actions of actors operating at the second-order level. Yet, although both levels are characterized by intentionality, change is derivative of purposeful action and thus autogenic. This follows from the fact that even though first-order principles were deliberately formulated, they are a constant for the institutional system in question. Remaining within the analogy to physical systems, once set in motion, the mechanism continues to operate on its own.

Institutional change within the institutional system is the result of various causes. These causes may differ in nature, corresponding to the mechanisms mentioned at the outset of this section. They, in turn, are reflected in the respective groups of theories of institutional change. In the scope adopted in this article—that is, within the institutional system—the number of changes in a given period is monitored and known. In Poland, between 1989 and 2025, a total of 6,315 formal institutions at the statutory level were enacted. In successive parliamentary terms this amounted to (Sejm of the Republic of Poland, Lists of Statutes and Records of Legislative Proceedings): 1989–1991 (247); 1991–1993 (94); 1993–1997 (473); 1997–2001 (640); 2001–2005 (894); 2005–2007 (384); 2007–2011 (952); 2011–2015 (752); 2015–2019 (923); 2019–2023 (662); 2023–2025 (294). The causes of these changes may be examined retrospectively through the respective theories of institutional change. In line with the tripartite classification, some causes are explained evolutionarily, some in terms of collective choice, and some as autogenic.

The sum of these causes corresponds to the number of registered institutional changes. For analytical purposes, it may be assumed that the dominant cause of a given institutional change can be interpreted within one of the theories of institutional change. This is a simplifying assumption adopted to maintain the clarity of the research procedure. It does not exclude the possibility that some institutional changes are multi-causal and may be partly explained by more than one theoretical framework. In such cases, the autogenic theory of institutional change should be understood as identifying a specific mechanism of change rather than providing an exhaustive explanation of all factors involved.

In general, the epistemic capacity of the theory of institutional change consists in identifying and explaining the causes of changes that occur within the institutional system. The autogenic theory has an advantage over the others in that, operating on the basis of first-order principles, it moves within a formalized and closed legal environment. As a result, the institutions initiating changes are known, as are the effects of their actions. Hence, it is possible to determine with certainty the causes of particular changes and to explain the purpose of their initiation. By contrast, the other groups of theories of institutional change operate outside the closed framework defined by

first-order principles. The number of variables influencing the institutional system is indeterminate. This leads to the well-known problem in economics of an excessive number of variables, which requires abstraction (Lange, 1978), or isolation (Mäki, 1992; Mäki, 2004), or idealization (Nowak 1977). As a consequence, some causes must be omitted in the process of modeling. Only the autogenic theory of institutional change can provide a full account of that part of institutional change which has been initiated by actors through actions envisaged by first-order principles. Thus, the epistemic capacity of the autogenic theory of institutional change is excellent within its domain of application, provided the research process is properly conducted. And although it cannot account for all changes, those within its scope can be accurately identified and explained.

2.1. The Activity of the Constitutional Tribunal in the Years 1986–2025 as an Empirical Research Domain of the Autogenic Theory of Institutional Change

Before turning to the empirical material, it is worth situating the analysis that follows within the epistemic framework set out in Section 1.1. Three properties identified there—formalization, hermeticity within the research domain, and interpretability of mechanisms—are not merely abstract desiderata but the very features that the activity of the Constitutional Tribunal allows us to trace empirically. The formalized procedures of constitutional review, the hermetic character of the institutional system as a closed domain governed by first-order principles, and the resulting interpretability of the Tribunal's interventions together constitute the triad through which the epistemic capacity of the autogenic theory is examined in the remainder of this article.

The autogenic theory of institutional change finds application in the study of the activity of the Constitutional Tribunal (CT). In Poland, the CT began operating on 1 January 1986 on the basis of the Act of 29 April 1985 (Dz.U. 1985, nr 22, poz. 98), which introduced a new quality into the Polish institutional system. It should be noted that in the People's Republic of Poland (PRL) the competences of the CT were significantly limited, since under Article 33 of that Act, the Tribunal's judgments acquired legal force only after approval by the Sejm. Moreover, the catalogue of entities authorized to submit motions was very narrow, as was the Tribunal's jurisprudence (cf. Table 1). During that period, the CT's activity was limited to abstract review of the constitutionality of statutes and normative acts—specifically, the compliance of statutes and other normative acts of central state organs with the Constitution, ratified international agreements, and statutes, as provided for in Article 1 of the Act (Dz.U. 1985, nr 22, poz. 98). Abstract constitutional review, as opposed to concrete review, consists in examining a normative

act “in isolation” from a specific case and without connection to its application to a particular person or situation (Kryszewski, 2014). In practice, this meant that both the possibility of initiating constitutional review and the effectiveness of judgments depended on the political balance of power. In addition, the Constitutional Tribunal functioned within the framework of second-order principles—as per the conceptual terminology adopted herein. It was not formally embedded within the first-order principles. Nevertheless, as of 1 January 1986 one may speak of the introduction into the Polish institutional system of the first—though not independent—mechanisms of legal correction. In other words, from that moment onwards, there were certain premises for the heuristic application of the concept of autogenic institutional change in Poland.

The constitutional amendment of 29 December 1989 (Dz.U. 1989, nr 75, poz. 444), which modified the Constitution of the PRL, strengthened the position of the CT and anchored its functioning within the first-order principles. Pursuant to the newly added Article 33a(1) of the 1952 Constitution of the PRL, “The Constitutional Tribunal shall adjudicate on the conformity of statutes and other normative acts with the Constitution.” This could be read literally as a narrowing of the CT’s scope of action, yet under the applicable Act (second-order principles), the catalogue of activities remained exactly the same as before the amendment. The most important change occurred in the Tribunal’s rulings, which no longer required approval by the Sejm but were binding. The earlier mechanism of political control over the force of CT judgments, contained in Article 33 of the 1952 Act (Dz.U. 1952, nr 22, poz. 98), was thus removed. At the same time, the amendment expanded the range of entities entitled to petition the Tribunal (cf. Table 1). According to the 1952 Act on the Constitutional Tribunal as amended in 1989 (Dz.U. 1989, nr 75, poz. 444, Article 11), applications for review of conformity of a normative act with the Constitution could be submitted by: the President of the Republic of Poland, the Presidium of the Sejm, the Prime Minister, the First President of the Supreme Court, the President of the Supreme Administrative Court, the Prosecutor General, the President of the Supreme Audit Office, the Commissioner for Citizens’ Rights (Ombudsman), a group of at least 50 deputies, and a group of at least 30 senators. This introduced a qualitative change, as although the CT’s activities still primarily consisted of abstract review, the foundations were already in place for the development of concrete review. The latter consists in examining the conformity of a normative act with the Constitution within the context of a specific case pending before a court. Such a regulation was included in Article 12 of the Act on the CT (Dz.U. 1989, nr 19, poz. 101), providing: “If a court hearing a case has doubts as to the conformity of a normative act with the Constitution, a ratified international agreement, or a statute, it may present a legal question to the Constitutional Tribunal concerning the conformity of that act.” Thus,

even though the CT's activity remained limited in terms of the scope of actions and the entities authorized to initiate it, it assumed a more autonomous character in safeguarding the institutional system. In this context, it should be noted that as of 29 December 1989, the heuristic potential and applicability of the concept of autogenic institutional change in explaining formal institutional transformations in Poland became more apparent compared to the preceding period. This follows from the fact that one of the features of this model is independence. Prior to 1989, the ultimate say on constitutionality rested with the Sejm (the law-making body), rather than with the Constitutional Tribunal (a body not engaged in law-making). Thus, the application of the concept of autogenic institutional change between 1986 and 1989 may be considered questionable due to the absence of independence. After 1989, however, this problem was resolved, and the CT's activity was situated within the framework of first-order principles.

Another decisive moment for the heuristic potential of the concept of autogenic institutional change in Poland was the adoption of the Constitution of the Republic of Poland of 2 April 1997 (Dz.U. 1997, nr 78, poz. 483). The amendment of the Constitution—that is, of the first-order principles—transformed the Constitutional Tribunal into a body with broader powers in terms of its range of activities and strengthened its decisional position. This change affected the catalogue of CT's activities, thereby increasing the frequency of situations in which the concept of autogenic institutional change could be applied. Returning to the substance, Article 188 of the Constitution of the RP provides: "The Constitutional Tribunal shall adjudicate in matters: the conformity of statutes and international agreements with the Constitution, the conformity of statutes with ratified international agreements whose ratification required prior statutory consent, the conformity of legal regulations issued by central state organs with the Constitution, ratified international agreements and statutes, the conformity with the Constitution of the purposes or activities of political parties, and constitutional complaints as referred to in Article 79(1)." Furthermore, Article 190(1) of the Constitution of the RP stipulates that: "Judgments of the Constitutional Tribunal shall be universally binding and final." The range of entities authorized to apply to the Tribunal was also expanded. According to Article 191(1) of the Constitution of the RP, applications in matters specified in Article 188 may be filed by: the President of the Republic, the Marshal of the Sejm, the Marshal of the Senate, the Prime Minister, 50 deputies, 30 senators, the First President of the Supreme Court, the President of the Supreme Administrative Court, the Prosecutor General, the President of the Supreme Audit Office, the Commissioner for Citizens' Rights, the National Council of the Judiciary—within the scope referred to in Article 186(2), legislative bodies of local self-government units, nationwide authorities of trade unions, nationwide authorities of employers' organizations and professional organizations, churches and other

religious associations, and entities indicated in Article 79 within the scope specified therein (constitutional complaint).

The introduction of this catalogue meant that a wide range of actors—state institutions, social organizations, and individual citizens—gained access to the Tribunal. It should be emphasized that these changes resulted in the CT for the first time combining different forms of review (Garlicki, 2010; Koniecko, 2022):

- abstract review (examination of the constitutionality of statutes, international agreements, and normative acts of central bodies),
- specific review (examination of the conformity with the Constitution of the goals and activities of political parties),
- concrete review (in the form of constitutional complaint).

The foregoing adjustments within the functioning of the protective mechanisms of the institutional system contributed to transforming the Constitutional Tribunal into a body with far broader capacities to influence the legal system. Thus, the Tribunal became a key element of the system safeguarding the institutional order in Poland. To summarize, from the moment the Constitution of the Republic of Poland of 1997 entered into force—broadening the catalogue of the CT's competences and granting its judgments final and universally binding force (Article 190(1))—the protective mechanisms of the institutional system increasingly began to display features of autogenicity (cf. Table 1), in comparison with earlier periods.

The autogenic character of changes within the institutional system, expressed through the activity of the CT, is neither spontaneous nor accidental. These changes are purposeful and directed, as they arise from the constitutional systemic principles deliberately established by the legislator. It is these principles that define the framework and direction of subsequent changes within the institutional system. At the same time, the consequences of these actions may extend beyond what was directly envisaged in the legislative process, since the harmonization of legal provisions triggers further adjustments within the institutional system, resulting from the very logic of its functioning.

The significance of these autogenic mechanisms became particularly evident during the systemic transformation after 1989 and following Poland's accession to the European Union in 2004. Membership in the EU entailed the obligation to adapt domestic law to the Community legal order (*acquis communautaire*), as provided in the Accession Treaty of 16 April 2003 (Dz.U. 2004, nr 90, poz. 864/865) and in Article 91(3) of the Constitution of the Republic of Poland, which stipulates that: "If it follows from a ratified international agreement constituting an international organization to which the Republic of Poland belongs, the law established by that organization shall be applied directly and shall take precedence in the event of a conflict with statutes." Consequently, law enacted by an international organization of which

Poland is a member takes precedence in the case of inconsistency with a statute. This process required a series of deliberate changes in legislation as well as in the jurisprudence of the Constitutional Tribunal, which reviewed the conformity of new regulations with the Constitution.

An example of the Constitutional Tribunal's activity that illustrates the autogenic character of the institutional system is the constitutional amendment of 8 September 2006 (Dz.U. 2006 nr 200 poz. 1471). This amendment introduced exceptions in Article 55(2) and (3) to the prohibition on extraditing Polish citizens, following the CT's judgment of 27 April 2005 (case no. P 1/05, OTK ZU 2005/4A/42), which declared the provisions of the Code of Criminal Procedure on the European Arrest Warrant (EAW) inconsistent with Article 55(1) of the Constitution. Such actions set in motion further adaptive processes within the entire legal system. Initially, the changes were of an adjustment character, but their effects spread further, leading to additional harmonization within Poland's institutional system.

In the case of the EAW, amendments were required inter alia to the Code of Criminal Procedure (Act of 18 March 2004 amending the Penal Code, the Code of Criminal Procedure, and the Code of Petty Offences, Dz.U. 2004, nr 69, poz. 626) and to the provisions regulating judicial cooperation. In particular, this concerned:

- the Act of 27 July 2001 – Law on the System of Common Courts (Dz.U. 2001, nr 98, poz. 1070), which was adjusted in respect of the competence of courts to examine applications for surrender under the EAW,
- the Act of 29 July 2005 amending the Code of Criminal Procedure and certain other statutes (Dz.U. 2005, nr 163, poz. 1363), which clarified the procedure for the surrender of Polish citizens.

The combined application of these legal acts ensured the consistency of domestic law with both the Constitution of the Republic of Poland and EU law. At the same time, each of these steps entailed further changes in the legal system. In other words, once triggered, the mechanism safeguarding the institutional system led to successive adjustments in judicial practice and legislation, which aptly illustrates the autogenic theory of institutional change.

2.2. Research Procedure within the Autogenic Theory of Institutional Change

The data used in the quantitative categorization method of textual material, concerning case codes and types of judgments, were obtained from the Internet Portal of Constitutional Tribunal Judgments (<https://ipo.trybunal.gov.pl>). The analysis adopted a division of Constitutional Tribunal judgments according to the criterion of the timing of constitutional review (a priori vs. a posteriori) and the form of constitutional review (abstract, specific, concrete). Within the first element, two categories were distinguished: a priori—

that is, review of the conformity of a normative act with the Constitution before it enters into force; and a posteriori—that is, review of the conformity of a normative act with the Constitution after it has entered into force and been applied in practice. Within the second element, three principal categories were distinguished:

- abstract review, covering the examination of the conformity of statutes, international treaties, and legal acts of central state organs with the Constitution (case code K, U);
- specific review, concerning the assessment of the objectives and activities of political parties (case code Pp);
- concrete review, referring to individual cases conducted through legal questions submitted by courts and constitutional complaints (case code P, SK).

For the sake of completeness and transparency, other competences of the CT were excluded from the analysis, such as the resolution of competence disputes (case code Kpt) and the determination of an obstacle to the exercise of the office of the President of the Republic of Poland (case code M), which were treated as separate from the main stream of constitutional review. For the purpose of analysis, it should be added that in the years 1986–1997 the database also includes historical case codes:

- Uw – applications for declaring the conformity of legal provisions issued by central state organs with the Constitution, ratified international treaties, or statutes, initiated ex officio by the Constitutional Tribunal;
- Kw – applications for declaring the conformity of statutes or ratified international treaties with the Constitution and the conformity of statutes with international treaties requiring prior statutory consent, initiated ex officio by the Constitutional Tribunal.

The possibility of initiating cases ex officio existed under the Act of 29 April 1985; since the 1997 Constitution, the CT has not initiated proceedings ex officio, and therefore case codes such as Uw and Kw do not appear in the contemporary register. In the classification presented in section 2.3 (Results), these case codes were treated as follows: Uw – equivalent to a posteriori abstract review type U; Kw – equivalent to a posteriori abstract review type K. Additionally, the research distinguishes the following case code:

- W – cases concerning universally binding interpretation of statutes (interpretative resolutions in force until the entry into effect of the 1997 Constitution). This was an interpretative, not a review instrument; reported separately, without classification as abstract/specific/concrete review;
- S – resolutions with a signaling function (sygnalizacje) under Article 80 of the Act on the CT. A non-binding, recommendatory instrument; reported separately as an indicator of pressure for legal change, without classification as constitutional review;

- T – interim orders (security). A procedural, provisional instrument; recorded for a full picture of case proceedings, without classification as review;
- Ts – preliminary review of constitutional complaints. Under this case code, the CT conducts the stage of formal selection of complaints; once admitted, the case is assigned a final symbol SK (or ends with an order at the preliminary stage);
- Tw – preliminary review of applications, which after positive selection receive a case code K or U, depending on the subject.

It should be noted that cases marked with case code Kp—applications of the President of the Republic of Poland for review of the constitutionality of statutes before signing or international treaties before ratification—were deliberately excluded from the category of abstract review. Such cases were treated as a separate category, since they correspond to a special form of a priori review, i.e. the assessment of constitutionality before a normative act enters into force. All other forms of review (K, U, Pp, P, SK) concern acts already in force and thus fall within the category of a posteriori review. This distinction makes it possible to capture the dual role of the CT as a preventive body, safeguarding the system against the adoption of unconstitutional regulations, and as a corrective body, eliminating from the legal order norms inconsistent with the Constitution only after their application.

The study was conducted in a chronological framework corresponding to three identified stages in the institutional development of the Tribunal: the initial period (1986–1989), when the CT operated solely on the basis of the 1985 Act and thus within the second-order principles; the transitional period (1989–1997), when it was incorporated into the PRL Constitution and its competences were gradually expanded—the CT then operated already within the first-order principles; and the contemporary period (1997–2025), in which the CT operates within the first-order principles, i.e. the 1997 Constitution of the Republic of Poland. These temporal frames make it possible to capture changes both in the intensity and in the structure of the Tribunal's interventions in the various forms of review, with an additional distinction between a priori and a posteriori review.

For a full understanding of the specificity of the examined judgments, it is also necessary to consider their procedural characteristics. Therefore, the analysis refers to two additional dimensions: the stage of proceedings and the type of document. In terms of stage of proceedings, three basic categories are distinguished. First, preliminary review, in which the CT examines the admissibility of an application, legal question, or constitutional complaint in formal and procedural terms; many cases are terminated at this stage without substantive examination. Second, resolutions with a signaling function (*sygnalizacyjne* resolutions), i.e. resolutions adopted under Article 80 of the Act on the CT, in which the Tribunal indicates the need for legislative

changes or the removal of legal defects; this instrument is recommendatory and does not entail binding consequences for the legislator. Third, substantive adjudication, the stage in which the CT assesses the conformity of law with the Constitution and issues a judgment—the only form of decision that is universally binding and final. Other documents, such as orders or signaling resolutions, do not have such an effect, serving instead a procedural or advisory role.

As for the type of document, several forms of decision can be distinguished:

- judgment (wyrok) – the basic form of substantive decision, in which the CT declares the conformity or non-conformity of a normative act with the Constitution of the RP, a statute, or an international treaty. It is universally binding and final (Article 190 of the Constitution of the RP);
- order (postanowienie) – the most common form of decision, concerning mainly procedural issues (dismissal of a complaint, discontinuance of proceedings, refusal to admit). It does not decide on the merits of conformity with the Constitution;
- interim order (postanowienie tymczasowe) – a special category of orders serving to secure proceedings. The CT may suspend the application of a provision until judgment to avoid irreversible consequences;
- resolution (uchwała) – used especially in signaling resolutions (Article 80 of the Act on the CT), in which the Tribunal indicates the need for legal changes, even if it does not directly declare unconstitutionality;
- decision (rozstrzygnięcie) – a document issued in special cases, e.g. when resolving competence disputes (case code Kpt) or in the procedure for determining an obstacle to the exercise of the office of the President of the RP (case code M);
- ruling (orzeczenie) – a collective category used in the database for various types of final documents, including those that do not fit neatly into the above classifications.

The inclusion of these categories makes it possible not only to classify the actions of the Constitutional Tribunal formally, but also to understand the mechanics of its functioning—from preliminary case selection, through its advisory role, to issuing binding judgments that transform the legal system. **Each type of Tribunal judgment was then assessed to determine whether it contained an autogenic protective mechanism as defined in Table 1. Judgments with this mechanism present were interpreted as instances of autogenic institutional change, whereas other judgments were treated as falling outside the direct explanatory scope of the autogenic theory and as potentially requiring alternative theoretical explanations.**

2.3. Results

In the first period of the Constitutional Tribunal's activity (1986–1989), 60 cases were decided in substantive proceedings, with only a marginal share of resolutions with a signaling function (7) and preliminary review (2).

The core of activity consisted of a posteriori abstract review, which—according to the adopted methodology—is counted jointly as: U (applications for declaring the conformity of legal provisions issued by central state organs with the Constitution, ratified international treaties, or statutes) and Uw (cases initiated ex officio—the historical equivalent of U), as well as K (applications for declaring the conformity of statutes or ratified treaties with the Constitution and the conformity of statutes with treaties requiring prior statutory consent) and Kw (cases initiated ex officio—the historical equivalent of K). In this framework, a posteriori abstract review comprised a total of 52 cases: U (28) + Uw (12) and K (11) + Kw (1).

A posteriori concrete review was less frequent: P (legal questions concerning the conformity of a normative act with the Constitution, ratified treaties, or statutes) – 8 cases.

Specific review did not occur: Pp (applications concerning the conformity of the objectives or activities of political parties with the Constitution) – 0.

In the second period (1989–1997), substantive proceedings dominated (298), with smaller shares of resolutions with a signaling function (12) and preliminary review (11). From the perspective of the adopted classification, the core remained a posteriori abstract review, i.e.: K – applications for declaring the conformity of statutes or ratified international treaties with the Constitution, and the conformity of statutes with treaties requiring prior statutory consent (118), plus historical cases Kw—applications initiated ex officio (2), giving a total of $K+Kw = 120$; and U – applications for declaring the conformity of legal provisions issued by central state organs with the Constitution, ratified international treaties, or statutes (65).

A posteriori concrete review was less common and limited to legal questions (P) – 19 cases.

Specific review did not occur (0), nor did a priori review (0).

For a full picture, the study also included categories outside the main typology: W – cases concerning universally binding interpretation of statutes (94) – a competence valid until the entry into force of the 1997 Constitution; S – resolutions with a signaling function (12); T – interim orders (11).

From the perspective of document type, the distribution was: rulings (orzeczenia) (142), orders (98), resolutions (81), which together yield 321 items in the results (including substantive proceedings, signaling resolutions, and preliminary review).

In the third period (16 October 1997–2025), the Tribunal's activity included substantive proceedings (3,228), preliminary review (10,150), and resolutions with a signaling function (68).

Within the adopted categories of review, a posteriori review dominated: K – applications for declaring the conformity of statutes or ratified treaties with the Constitution, and the conformity of statutes with treaties requiring prior statutory consent (923); and U – applications for declaring the conformity of legal provisions issued by central state organs with the Constitution, ratified treaties, or statutes (179).

A posteriori concrete review included P – legal questions (739) and SK – constitutional complaints (1,331).

Specific review occurred sporadically: Pp – applications concerning the conformity of the objectives or activities of political parties with the Constitution (7).

A priori review was incidental and remains separated from abstract review: Kp – applications of the President of the Republic of Poland for review of statutes before signing or international treaties before ratification (41). Outside the main typology, the study also recorded: Kpt – applications concerning competence disputes between central constitutional organs of the state (5); and, marginally, W – cases concerning universally binding interpretation of statutes (3). No cases of type M – applications of the Marshal of the Sejm for declaring an obstacle to the exercise of the office of the President of the Republic of Poland – were recorded (0).

From the perspective of document types, orders dominated (11,898), followed by judgments (1,529), interim orders (16), and individual decisions (3). In preliminary review, the majority of cases were registered under Ts (9,300) and Tw (789), which—according to the adopted research procedure—are not included in the indicators of constitutional review.

3. Conclusion

The heuristic usefulness of particular theories of institutional change reveals itself in their selection in such a way that they reflect the actual conditions of change and correspond to the aim that the researcher intends to achieve. When seeking a specific initiator of change, it is worth turning to theories that assume the agency of an individual actor. If, on the other hand, the focus is on the conditions under which change may arise, it is more appropriate to apply theories that take into account the influence of endogenous conditions or extraordinary events. Other theories will be relevant in the study of social transformations and civilizational evolution, while still others may provide explanations for the actions of interest groups (Sukiennik, Czetwertyński, Brol, 2025).

When examining institutional changes within the institutional system, the researcher should employ the autogenic theory of institutional change, though its explanatory capacity is naturally limited. Referring back to the research question posed at the outset of this article—namely: which factors characteristic of the autogenic theory of institutional change account for its epistemic capacity in explaining institutional changes within the institutional system?—the answer should be formulated in two perspectives.

First, in the hypothetico-deductive perspective, the factors shaping the epistemic capacity of the autogenic theory of institutional change are: (1) formalization and (2) closed nature within the research domain. This domain is the institutional system, whose formalized character and closed nature make it possible to achieve an excellent level of epistemic capacity with respect to explaining the relationship between causes and outcomes of institutional change.

Second, in the empirical perspective, the research method of the autogenic theory of institutional change makes it possible to adequately explain the specificity of certain processes occurring within the Polish institutional system. This concerns its legal component, and specifically the changes initiated by the Constitutional Tribunal. The epistemic capacity of the autogenic theory of institutional change in the empirical perspective finds expression in the interpretation of mechanisms of constitutional review and the resulting transformations within the legal system. Thus, in this perspective, the relevant factor is (3) the interpretability of constitutional review mechanisms. However, its epistemic capacity is not perfect, first, due to the unintended consequences of legal harmonization, and second, due to the limited scope of the Constitutional Tribunal's activities, which are confined to mechanisms of constitutional review.

The analysis carried out in both the hypothetico-deductive and empirical perspectives confirms that the autogenic theory of institutional change makes it possible to adequately explain the specificity of certain processes occurring within the Polish institutional system—specifically its legal component, i.e. changes initiated by the Constitutional Tribunal. It should nevertheless be emphasized that this represents only a fragment of the broader picture, as the overall scale of legislative production in Poland is vast, and the changes that can be explained by means of the autogenic theory constitute only a limited fraction of the whole. Nevertheless, within the institutional system, processes initiated by the Constitutional Tribunal are accurately interpreted, and the transition from causes to changes can be closely traced. Therefore, the epistemic capacity of the autogenic theory of institutional change is significant from the perspective of studying institutional change in general. **At the same time, the scope of generalization of the findings should be treated with caution. The analysis conducted in this article refers to the Polish Constitutional Tribunal and therefore demonstrates the operation of autogenic institutional change within a specific constitutional and legal order. However, the proposed framework may provide a starting point for further comparative research on similar mechanisms**

in other countries. In such cases, autogenic institutional change could be examined as a mechanism through which the internal logic of the legal system generates further institutional adjustments. The transferability of this framework depends, however, on the constitutional position of the reviewing body, the binding force of its judgments, access to constitutional review, and the relationship between constitutional adjudication and legislative response. For this reason, the comparative verification of autogenic mechanisms in other legal systems should be regarded as a separate research task and a promising direction for future studies.

References

- Becker, G.S. (1976). *The economic approach to human behavior*. University of Chicago Press. <http://doi.org/10.7208/chicago/9780226217062.001.0001>.
- Blaug, M. (1992). *The methodology of economics, or, How economists explain* (2nd ed.). Cambridge University Press. <https://doi.org/10.1017/CBO9780511528224>
- Chalmers, A. F. (1999). *What is this thing called science?* (3rd ed.). Open University Press.
- Czetwertyński, S. (2023). Człowiek gospodarujący – niebezpieczna idea. <https://doi.org/10.15611/2023.40.4>.
- Czetwertyński, S., & Sukiennik, J. (2023). Skuteczność formalnych mechanizmów ochrony systemu instytucjonalnego w Polsce. *Zeszyty Naukowe Polskiego Towarzystwa Ekonomicznego w Zielonej Górze*, Article 18. <https://doi.org/10.26366/PTE.ZG.2023.237>
- Czetwertyński, S., Sukiennik, J., & Przysada, K. (2021). Harmonizacja systemu instytucjonalnego w Polsce. *Zeszyty Naukowe Polskiego Towarzystwa Ekonomicznego w Zielonej Górze*, 15, 103–116. <https://doi.org/10.26366/PTE.ZG.2021.206>
- Demsetz, H. (2008). *From economic man to economic system: Essays on human behavior and the institutions of capitalism*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511510656>
- Dequech, D. (2007). Neoclassical, mainstream, orthodox, and heterodox economics. *Journal of Post Keynesian Economics*, 30(2), 279–302. <https://doi.org/10.2753/pke0160-3477300207>
- Feyerabend, P. (1975). *Against method: Outline of an anarchistic theory of knowledge*. NLB; Humanities Press.
- Friedman, M. (1953). *Essays in positive economics*. University of Chicago Press.
- Garlicki, L. (2010). *Polskie prawo konstytucyjne: zarys wykładu* (9th ed.). Liber.
- Hall, R. L., & Hitch, C. J. (1939). Price theory and business behaviour. *Oxford Economic Papers*, 2, 12–45. <http://www.jstor.org/stable/2663449>
- Hardt, Ł. (2013). *Studia z realistycznej filozofii ekonomii*. C.H. Beck.
- Hodgson, G. M. (2006). What are institutions? *Journal of Economic Issues*, 40(1), 1–25. <https://doi.org/10.1080/00213624.2006.11506879>.

- Internetowy Portal Orzeczeń Trybunału Konstytucyjnego. Retrieved 09.09.2025. <https://ipo.trybunal.gov.pl>
- Kahneman, D. (2012). *Pułapki myślenia: O myśleniu szybkim i wolnym* (P. Szymczak, Trans.). Media Rodzina.
- Keynes, J. N. (1891). *The scope and method of political economy*. Macmillan and Co.
- Kingston, C., & Caballero, G. (2009). Comparing theories of institutional change. *Journal of Institutional Economics*, 5(2), 151–180. <https://doi.org/10.1017/S1744137409001283>
- Koniecko, M. (2022). Kontrola konstytucyjności prawa w Polsce po 1997 roku. *Przegląd Prawa Konstytucyjnego*, 62(4), 25–42.
- Kozyr-Kowalski, S. (2000). *Socjologia, społeczeństwo obywatelskie i państwo*. Wydawnictwo Naukowe UAM.
- Kryszeń, G. (2014). Trybunał Konstytucyjny. In S. Bożyk (Ed.), *Prawo konstytucyjne* (pp. 351–365). Temida 2.
- Kuhn, T. S. (1962). *The structure of scientific revolutions*. University of Chicago Press.
- Kundera, E. (Ed.). (2014). *Słownik historii myśli ekonomicznej*. Oficyna Wolters Kluwer Business.
- Lakatos, I. (1978). *The methodology of scientific research programmes: Philosophical papers* (J. Worrall & G. Currie, Eds.). Cambridge University Press. <https://doi.org/10.1017/CBO9780511621123>
- Lange, O. (1978). *Ekonomia polityczna* (Vols. I–II). Państwowe Wydawnictwo Naukowe.
- Leszczyński, L. (2023). A developed conception of the sources of law: The context of the role of political justification, custom and precedent. *Ruch Prawniczy, Ekonomiczny i Socjologiczny*, 85(2), 17–29. <https://doi.org/10.14746/rpeis.2023.85.2.03>
- Mahoney, J., & Thelen, K. (Eds.). (2010). *Explaining institutional change: Ambiguity, agency, and power*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511806414>
- Motycka, A. (1980). *Relatywistyczna wizja nauki: Analiza krytyczna koncepcji T. S. Kuhna i S. E. Toulmina*. Zakład Narodowy im. Ossolińskich.
- Mäki, U. (1992). On the method of isolation in economics. *Poznan Studies in the Philosophy of the Sciences and the Humanities*, 26, 319–354. https://doi.org/10.1163/9789004457256_016
- Mäki, U. (2004). Theoretical isolation and explanatory progress: Transaction cost economics and the dynamics of dispute. *Cambridge Journal of Economics*, 28(3), 319–346.
- North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511808678>
- Nowak, L. (1977). *Wstęp do idealizacyjnej teorii nauki*. Państwowe Wydawnictwo Naukowe.

- Pejovich, S. (1999). The effects of the interaction of formal and informal institutions on social stability and economic development. *Journal of Markets & Morality*, 2(2), 164–181.
- Ritzer, G. (1975). Sociology: A multiple paradigm science. *The American Sociologist*, 10(3), 156–167. <https://doi.org/10.2307/2063000>
- Robbins, L. (1932). *An essay on the nature and significance of economic science*. Macmillan and Co.
- Scheuer, B. (2015). *Metodologia ekonomii w perspektywie konstruktywistycznej*. Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu.
- Sejm Rzeczypospolitej Polskiej. *Wykazy ustaw i przebieg prac sejmowych*. Retrieved 29.09.2025, [https://orka.sejm.gov.pl/procx.nsf/w-wykazy-ustawy/\\$first?OpenDocument](https://orka.sejm.gov.pl/procx.nsf/w-wykazy-ustawy/$first?OpenDocument);
[https://orka.sejm.gov.pl/proc1.nsf/w-wykazy-ustawy/\\$first?OpenDocument](https://orka.sejm.gov.pl/proc1.nsf/w-wykazy-ustawy/$first?OpenDocument);
<https://orka.sejm.gov.pl/proc2.nsf/0/D217466AE3009ABDC125745900383742?opendocument>;
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https://www.sejm.gov.pl/Sejm9.nsf/page.xsp/prace_sejmu;
https://www.sejm.gov.pl/Sejm10.nsf/page.xsp/prace_sejmu.
- Streeck, W., & Thelen, K. (Eds.). (2005). *Beyond continuity: Institutional change in advanced political economies*. Oxford University Press.
- Sukiennik, J., Czetwertyński, S., & Brol, M. (2025). *Teoria zmiany instytucjonalnej* (p. 92). Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu. <https://doi.org/10.15611/2025.35.1>
- Sułkowski, Ł. (2012). *Epistemologia i metodologia zarządzania*. PWE.
- Thaler, R. H. (2018). *Zachowania niepoprawne: Tworzenie ekonomii behawioralnej*. Media Rodzina.
- Act of 29 April 1985 on the Constitutional Tribunal (Ustawa z dnia 29 kwietnia 1985 r. o Trybunale Konstytucyjnym) (Dz.U. 1985, nr 22, poz. 98) (Poland).
- Act of 7 April 1989 amending the Constitution of the People's Republic of Poland (Ustawa z dnia 7 kwietnia 1989 r. o zmianie Konstytucji Polskiej Rzeczypospolitej Ludowej) (Dz.U. 1989, nr 19, poz. 101) (Poland).
- Act of 29 December 1989 amending the Constitution of the People's Republic of Poland (Ustawa z dnia 29 grudnia 1989 r. o zmianie Konstytucji Polskiej Rzeczypospolitej Ludowej) (Dz.U. 1989, nr 75, poz. 444) (Poland).

- Konstytucja Rzeczypospolitej Polskiej z dnia 2 kwietnia 1997 r. (Dz.U. 1997, nr 78, poz. 483) (Poland).
- Act of 27 July 2001 – Law on the Organisation of the Ordinary Courts (Ustawa z dnia 27 lipca 2001 r. – Prawo o ustroju sądów powszechnych) (Dz.U. 2001, nr 98, poz. 1070) (Poland).
- Treaty concerning the Accession of the Republic of Poland to the European Union, signed in Athens on 16 April 2003 (Traktat między Królestwem Belgii a Republiką Słowacką dotyczący przystąpienia do Unii Europejskiej, podpisany w Atenach w dniu 16 kwietnia 2003 r.) (Dz.U. 2004, nr 90, poz. 864) (EU).
- Government Declaration of 21 April 2004 on the binding force of the Treaty concerning the Accession of the Republic of Poland to the European Union, signed in Athens on 16 April 2003 (Oświadczenie rządowe z dnia 21 kwietnia 2004 r. w sprawie mocy obowiązującej Traktatu dotyczącego przystąpienia Rzeczypospolitej Polskiej do Unii Europejskiej, podpisanego w Atenach w dniu 16 kwietnia 2003 r.) (Dz.U. 2004, nr 90, poz. 865) (Poland).
- Act of 18 March 2004 amending the Criminal Code, the Code of Criminal Procedure and the Petty Offences Code (Ustawa z dnia 18 marca 2004 r. o zmianie ustawy – Kodeks karny, ustawy – Kodeks postępowania karnego oraz ustawy – Kodeks wykroczeń) (Dz.U. 2004, nr 69, poz. 626) (Poland).
- Act of 27 July 2005 amending the Criminal Code, the Code of Criminal Procedure and the Executive Penal Code (Ustawa z dnia 27 lipca 2005 r. o zmianie ustawy – Kodeks karny, ustawy – Kodeks postępowania karnego i ustawy – Kodeks karny wykonawczy) (Dz.U. 2005, nr 163, poz. 1363) (Poland).
- Judgment of 27 April 2005, case no. P 1/05 (Wyrok z dnia 27 kwietnia 2005 r. sygn. P 1/05), OTK ZU 2005/4A/42 (Poland).
- Act of 8 September 2006 amending the Constitution of the Republic of Poland (Ustawa z dnia 8 września 2006 r. o zmianie Konstytucji Rzeczypospolitej Polskiej) (Dz.U. 2006).

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Appendix

Table 1. Autogenic Protective Mechanisms of the Institutional System in the CT

Period	Legal Basis	Nature of CT Judgments	Scope of Constitutional Review	Active Legitimacy
1985–1989	Dz.U. 1985, nr 22, poz. 98	Judgments required approval by the Sejm (Art. 33)	Abstract review: compliance of statutes and other normative acts of central state organs with the Constitution, ratified international agreements, and statutes	Presidium of the Sejm, Prime Minister, First President of the Supreme Court, Prosecutor General, President of the Supreme Administrative Court (Art. 11)
1989–1997	Dz.U. 1989, nr 75, poz. 444 oraz Dz.U. 1989, nr 19, poz. 101).	Binding judgments, no longer requiring approval by the Sejm (Art. 33a of the PRL Constitution)	Abstract review, and to some extent concrete review through legal questions submitted by courts	President, Presidium of the Sejm, Prime Minister, First President of the Supreme Court, President of the Supreme Administrative Court, Prosecutor General, President of the Supreme Audit Office, Ombudsman, group of 50 deputies, group of 30 senators
od 1997 r.	Dz.U. 1997, nr 78, poz. 483	Judgments are universally binding and final (Art. 190)	Review: abstract, specific, and concrete	President, Marshals of the Sejm and Senate, Prime Minister, 50 deputies, 30 senators, First President of the Supreme Court, President of the Supreme Administrative Court, Prosecutor General, President of the Supreme Audit Office, Ombudsman, National Council of the Judiciary, local government bodies, nationwide trade unions, nationwide employers' and professional organizations, churches and religious associations, citizens

Source: Author's compilation based on Dz.U. 1985, nr 22, poz. 98; Dz.U. 1989, nr 75, poz. 444; Dz.U. 1989, nr 19, poz. 101; Dz.U. 1997, nr 78, poz. 483.



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Leisure Mobility Among Young Urban Residents: A Case Study of the GZM Metropolis

ANNA MERCIK

Faculty of Management, University of Economics in Katowice,

ul. 1 Maja 50, 40-287 Katowicey

✉ anna.mercik@ue.katowice.pl

 ORCID: /0000-0003-4926-0148

Abstract

Motivation: The post-pandemic shift in working patterns (the spread of remote and hybrid working) can lead to significant changes in daily mobility patterns. These changes may raise questions about their impact on leisure travel behaviour, modal choices and urban transport sustainability. Understanding how young citizens of the GZM Metropolis use their leisure time and how they fulfil their mobility needs is crucial for shaping policies that support sustainable mobility and urban development.

Aim: This study investigated how work organisation influences the leisure-time mobility patterns of residents of the GZM Metropolis, aged under 35. It investigated whether increased time autonomy have an impact on changes in leisure-time activity preferences, travel frequency and transport mode choice. The findings contribute to the discussion on sustainable urban mobility policy.

Results: The results indicate that while remote and hybrid work may increase flexibility in time management, it does not directly lead to more frequent leisure-related travel. Recreational mobility in the GZM area largely relies on car transport, posing a challenge to developing a sustainable urban mobility model that also considers leisure travel. The study



highlights the need for greater attention from policymakers to the impact of “unsustainable” leisure mobility on balancing urban transport systems. By linking changes in recreational behaviours with transport policies, it provides valuable insights for policymakers, planners, and researchers working on sustainable mobility and transport strategies.

Keywords: leisure mobility, sustainable mobility, mobility of young adults,

JEL: R49, Q01, R58

1. Introduction

Urban mobility is a manifestation of transportation needs related to the specific aspirations, preferences, and socio-economic conditions of urban area residents (Wojewódzka-Król K. & Załoga E., 2016). From the perspective of authorities involved in processes of urban mobility planning, the sources of transportation needs - particularly those arising from economic and social factors - are of key importance. They are result of the spatial distribution of places of residence, employment, and education, as well as locations for fulfilling daily needs and spending leisure time. They also play a crucial role in sustainability of urban transportation systems (Mendyk E., 2009).

It is generally assumed that travel related to work or education is mandatory mobility because this kind of trips are linked to the need to fulfil necessary daily obligations. This kind of trips dominate daily mobility patterns in urban areas, generating the highest levels of movement among city residents. Such travel is massive, regular, and relatively easy to manage. In contrast, leisure-related mobility is considered as optional movement which is a result of the subjective travellers preferences (Toger et al., 2023). This type of mobility is spatially dispersed and non-routine in nature, which significantly hinders the modelling of such movements. Leisure-time mobility is associated with individuals' need to access cultural services, as well as their engagement in social and physical activities. These journeys are characterized by lower regularity and are considerably more difficult to predict. As a result, they are often marginalized in the development of sustainable urban mobility policies.

Following the outbreak of the COVID-19 pandemic, widespread restrictions on physical mobility were introduced. One of the primary tools used to limit mobility was the broad implementation of remote work and education (Kos et al., 2021). Mobility data aggregated by Google LLC indicate that during the pandemic years, residents of Poland significantly reduced travel related to work. However, these restrictions did not result in a complete abandonment of physical leisure-time mobility. Available data suggest that, in the post-pandemic period, the number of movements in this area has

increased significantly. This indicates that, compared to the pre-pandemic period, there has been a shift in the structure of urban travel. Data generated by Apple further show that during the COVID-19 pandemic, there was a significant increase in the number of car journeys. These findings suggest that leisure mobility may potentially pose greater challenges in the development of sustainable urban mobility.

Pandemic experiences have shown that changes in the way city residents perform work can influence the structure of travel behaviour and increase the role of non-obligatory physical travel, particularly journeys related to leisure activities. The observed changes in urban travel patterns call for a new perspective on urban mobility planning. This includes a greater focus on the growing share of non-obligatory travel, the definition of the consequences of these changes, and the formulation of recommendations for integrating this issue into sustainable urban development policies.

The general objective of the study was to verify whether, within the GZM Metropolis (Upper Silesian-Zagłębie Metropolis), a change in the structure of travel occurred because of the shift in working patterns - specifically, whether there was an increase in leisure-related travel outside respondents' places of residence, and what impact this change has on sustainable urban mobility. GZM Metropolis (Upper Silesia-Zagłębie Metropolis) is a metropolitan association comprising 41 cities and municipalities in the Silesian Voivodeship, in southern Poland. It covers an area of 2,500 square kilometres and has a population of approximately 2.1 million. It has been operating since 2018 under the Act of 9 March 2017 on the metropolitan association in the Silesian Voivodeship. One of GZM's areas of activity is the planning, coordination, integration and development of public transport and sustainable urban mobility. This article focuses on issues related to leisure mobility among young adult residents of GZM. The study presents respondents' preferences regarding leisure activities and their preferred modes of travel related to these activities. The research aimed to identify the factors that may influence respondents' decision-making and assess whether the travel decisions related to leisure mobility are often lacking the attribute of "sustainability." The findings provide insights that may be valuable for planners and policymakers responsible for shaping sustainable urban mobility strategies.

The study adopts a qualitative approach, focusing on the attitudes and opinions of respondents regarding their travel behaviours during non-working hours. The analysis presented in the article is based on primary data collected in 2023 as part of a broader study on leisure-time mobility within the GZM area. The literature review outlines the theoretical context of the study. The methodology section details the research procedure. The results section presents key findings regarding the approach of young adult respondents residing in GZM. The research results were subjected to statistical analysis, which allowed for the identification of basic relationships between

the studied variables. In the discussion, the findings are compared with other results presented in the relevant literature. The study's limitations and possible directions for further research are also outlined.

It should be noted that this study is exploratory in nature, providing initial insights into leisure mobility patterns among young adults in the GZM Metropolis. The sample size limits the possibility of generalizing findings to the broader population. However, the results identify important trends and paradoxes that warrant further investigation. Based on the conducted analyses and discussion, practical recommendations were developed that may have real-world applications.

2. Literature review

A bibliographic analysis of the Scopus database conducted in March 2025 indicates that the topic of leisure time mobility is relatively new and under-researched. The first indexed publications on this subject date back to 1985. Since then, a total of 97 items have been published, with the highest number appearing in the past four years (2022–2025), amounting to 38 publications. Leisure mobility has most frequently been discussed within the fields of Social Sciences (75 publications), Business, Management and Accounting (22 items), and Environmental Science (18 publications).

In the Web of Science Core Collection, only 65 scientific publications relating to leisure mobility were indexed between 1993 and 2023. Most of these were categorized under Geography (17 publications), Hospitality, Leisure, Sport & Tourism (14 items), and Transportation (14 publications). The highest number of publications appeared in 2023 (10 publications), 2024 (9 publications), and in the years 2021 and 2015 (5 publications each). It should be noted, however, that many publications were indexed in both databases simultaneously.

Leisure mobility is spatially dispersed and non-routine, which makes it significantly more difficult to analyse compared to obligatory travel. Leisure travel lacks fixed spatial and temporal patterns (Ohnmacht et al., 2009). It is associated with the human need to engage in tourism and cultural activities, as well as social and physical engagement, making it considerably more flexible (Dubois & Ceron, 2006). It may also pertain to individuals who are no longer professionally active (Föbker & Grotz, 2006). However, similarly to mobility driven by obligatory needs, leisure mobility is also an important generator of external costs (Adamiak et al., 2016; Ceron & Dubois, 2005). Therefore, leisure mobility can be defined as voluntary travel, not related to professional or educational activities. It stems from individual preferences and needs regarding the form and location of leisure activities (Grubbe & Otto, 2011). For the purposes of this research, leisure mobility is understood

as voluntary travel unrelated to work and educational commitments. Leisure mobility is multidimensional phenomenon shaped by spatial flexibility, temporal variability and individual preferences. This conceptualization distinguishes leisure mobility from obligatory travel while acknowledging its complexity and multidimensional character.

An important issue discussed in the literature is the compensation of obligatory travel with voluntary travel (Næss, 2006). Based on the literature review, it was established that leisure mobility may depend on the following factors (Næss, 2006):

- social class of the respondents,
- income level,
- education level,
- age.

Studies indicate, for example, that individuals with higher education and income levels are more likely to engage in leisure industry services. People with lower income levels are more likely to spend their free time at home (Nessi, 2017) or closer to their place of residence. Leisure mobility in these cases tends to be more homogenous compared to individuals with higher incomes (Toger et al., 2023). Decisions about how leisure mobility is realized may also be influenced by whether children are being raised in the household (Jansson & and Sunding, 2024).

Other factors that can affect the frequency and distance of leisure trips include the day of the week, season, or place of residence. For example, individuals living in suburban areas may need to travel longer distances to engage in leisure activities (Toger et al., 2023).

Leisure mobility is strongly linked to car use (Tråsavik et al., 2024). The desire to spend free time outside the home is often used as a justification for car-based mobility, which can pose a significant challenge for the implementation of public policies aimed at developing sustainable urban mobility.

Among the most cited reasons for avoiding public transportation in the context of leisure mobility are:

- lack of suitable transport options (Tomej & Liburd, 2020),
- inadequate public transport connections (King et al., 2024),
- long travel times and reduced flexibility due to low frequency in remote areas (Bursa et al., 2022; Le-Klähn & Hall, 2015; Tomej & Liburd, 2020),
- low travel comfort (Juschten & Hössinger, 2021),
- the need for early planning because and low flexibility in case of changes (Juschten & Preyer, 2023),
- difficulties in organizing group travel (Juschten & Preyer, 2023).

It is important to note that even individuals who use public transportation for obligatory trips tend to prefer cars during their leisure time. Leisure activities often require transporting specific equipment, and in this regard,

private cars offer greater convenience than public transport (Tråsavik et al., 2024). Research shows that increased activity in areas with low public transport accessibility may result in increased reliance on private modes of transportation (e.g., cars, bicycles, or walking) (Östh et al., 2023). Interestingly, the spatial distribution of leisure destinations (e.g., recreational areas) also influences travel behavior—when such destinations are located near residential areas, leisure mobility tends to occur within the immediate vicinity of one's home (Türk et al., 2025).

One of the defining features of leisure mobility is its social character – studies indicate that only a small proportion of such trips are undertaken individually. This means that decisions regarding leisure travel must consider the individual needs and preferences of all participants involved. Furthermore, factors such as awareness of the location and attractiveness of leisure venues can influence how people spend their free time (Gramsch-Calvo & Axhausen, 2024).

The COVID-19 pandemic acted as a catalyst for changes not only in the way work is performed but also in how leisure time is structured. The pandemic altered patterns of leisure mobility, primarily due to fear of infection (Shakeel et al., 2023). Evolving work arrangements and the increasing emphasis on work-life balance may result in more individuals seeking to fulfill their leisure needs, thereby influencing the overall structure of urban travel.

Key trends in the development of leisure mobility in Poland include (CBOS, 2023; GUS, 2023; Łukaszewski, 2020):

- short-distance travel near the place of residence (e.g., for culture, entertainment, physical or social activity),
- short-term travel (private domestic and international trips lasting 2–4 days),
- long-term travel (private domestic and international trips exceeding 5 days for vacation purposes).

However, many people choose to spend their free time in ways that do not require leaving their homes - fulfilling their needs at home, including through the internet.

Data from the Transport Study of the Central Subregion of the Silesian Voivodeship (Transport study of the Central Subregion of the Silesian Voivodeship, 2020) show that approximately 45% of trips made in the central part of the Silesian Voivodeship, including the GZM area, are not related to work or education. Among those working from home, over 80% of their trips are connected to non-professional and non-academic activities. With current postulates to extend workers' free time and increase work time flexibility, it can be assumed that leisure mobility will present a significant challenge for shaping local sustainable urban mobility policies. In this context, research on leisure mobility can fill an important gap regarding the nature and role of voluntary travel in the balance of urban mobility systems. The data cited

above suggest that for individuals working remotely, voluntary travel (including leisure mobility) may constitute a significant share of urban travel. Therefore, the rise in remote work may be associated with a shift in the travel structure within the municipalities comprising the GZM.

Analysis of data from Statistics Poland (GUS) indicates that in 2022, as many as 81.1% of domestic leisure-related trips were made by car. In the medium term, a key challenge will be to reorient sustainable urban mobility models - which currently focus on obligatory trips - toward voluntary travel related to leisure activities.

A review of the literature indicates that studies on leisure mobility employ various techniques and methods. Most research in this area is qualitative in nature. Commonly used methods include cluster analysis, especially when examining preferred ways of spending free time and preferred mobility styles (e.g. (Ohnmacht et al., 2009; Strömblad, 2024)). In mobility geography studies, gravity models are applied to map preferences and related communication behaviors of selected social groups (Ghadiri et al., 2024; Türk et al., 2025). Sociological studies include video material analysis from specific locations (Normark, 2023), field studies (King et al., 2024), and in some cases, structural equation modeling (Shakeel et al., 2023). In addition to primary data collected through questionnaires, leisure mobility studies often use secondary data, including mobile network operator data (e.g. Toger et al., 2023; Talavera-Garcia et al., 2023).

3. Methods

The conducted study is qualitative in nature. Its geographical scope included the cities and municipalities that comprise the GZM Metropolis. For the purposes of this article, the following research questions were formulated:

- In the respondents' opinion, has the remote work model become more widespread after the COVID-19 pandemic?
- Do respondents feel they have more free time as a result of changes in the way they work?
- What are respondents' preferences regarding how they spend their free time?
- Which forms of leisure activities do respondents engage in most frequently?
- Does remote work influence the need to spend free time outside the place of residence?
- How do respondents travel for leisure-related activities?
- Can these trips be made using alternative means of transport?

The article presents selected results from the study that address the research questions. These results are based on a survey conducted in October 2023. The study involved a sample of 429 residents of the GZM, selected us-

ing a stratified quota sampling method. The general population was divided into strata based on age (age groups: 19-24, 25-34, 35-44, 45-54, 55-64) and the size of the municipality of residence (municipalities with up to 10,000 residents; up to 50,000; up to 100,000; and over 100,000 residents). These strata were defined proportionally to the share of each group in the overall population of GZM residents.

The following research techniques were used:

- Desk research - including a review of relevant literature and data from public opinion polls (e.g., by CBOS),
- Survey research using the CAWI method (Computer-Assisted Web Interviewing).

The survey questionnaire consisted of two parts:

- A demographic section with 10 questions to characterize the surveyed group,
- The main section containing 15 research questions, including items using a 7-point Likert scale.

The article focuses on the survey results for a subgroup of 121 GZM residents aged 18-34. Key data characterizing this subgroup are presented in Table 1. For the purposes of analysis, responses on the 7-point Likert scale were consolidated into 5 levels, by combining responses at levels 1 and 2, and likewise at levels 6 and 7. The study should be treated as a pilot study and cannot be generalized to the entire population. Nevertheless, the results provide exploratory insights that have become the basis for undertaking further, more extensive research on leisure mobility patterns in the GZM Metropolis.

4. Results

The conducted survey indicates that, according to 85.1% of respondents, the COVID-19 pandemic led to widespread adoption of remote and hybrid work models. Furthermore, 82.7% of respondents (61.2% answering “Yes” and 21.5% answering “Rather yes”) believe that the possibility of working remotely or in hybrid mode contributes to an increase in the amount of free time available to employees. Among the surveyed group, 69.4% of individuals declared that due to the COVID-19 pandemic, they changed their work model to fully or partially remote work. Among those who declared a change in their work model (84 people), 66.7% indicated that it led to an increase in the amount of free time available to them, 11.9% noted a slight increase in free time, 15.5% noticed no change, and 6% reported a decrease in available free time.

Respondents declare that the leisure activities they prefer are mainly carried out within the GZM Metropolis area (76.9% of respondents), although as many as 11.6% indicated that they do not spend their free time within the GZM Metropolis. The same percentage of respondents stated they were un-

sure how to answer this question. These responses may suggest that respondents are uncertain whether some of their leisure activities qualify as such, or they may only recognize tourism-related activities as leisure activities. Perhaps they are also unaware of the exact boundaries of the GZM.

Overall, respondents perceive a relationship between the form of work and the need to spend free time outside the home. 72.7% of respondents indicated that, in their opinion, the shift to remote work increases the need to spend free time outside the home. 17.4% of respondents had no opinion on this matter, and 7.4% believe that the work model does not impact the need for leisure activities outside the home.

The comparison of respondents' preferences (Figure 1) regarding how GZM residents spend their free time shows that they most frequently dedicate their free time to sports and recreational activities (55.7% of respondents) and activities at home (51.7% of respondents). Interestingly, activities related to using retail and gastronomy services ranked relatively low (18.9%). Spending leisure time using the Internet was indicated as a preferred activity by 38% of respondents. The Chi-square independence test results did not show a statistically significant relationship between leisure activity preferences and the respondents' place of residence, education level, wealth, or household size.

It should be noted that respondents far more often spend their free time on activities that do not require physical travel outside their homes (such as leisure activities at home and online) compared to activities that require even short trips (Figure 2). These findings are consistent with respondents' indications that their preferred leisure activities can mostly be realized at home - 81.8% of respondents confirmed this. Respondents declared that the most preferred active leisure activities are sports and recreational activities available within a 5 km radius and using retail and gastronomy services located no more than 5 km from their residence. These results suggest that young adults typically engage in leisure activities that either do not require mobility or can be accessed via sustainable travel modes. Most notably, leisure mobility is realized on foot - 57.0 % of respondents reported walking for leisure-related activities at least four times a week, while only 37.2% of respondents prefer to travel by car (as the driver) with the same frequency. Interestingly, the most frequently mentioned modes of transport that respondents never use are personal transport devices (62.8%) and bicycles (33.9%) (Figure 3).

This is surprising, considering that as many as 73.6% of respondents indicated that the distance to leisure activity locations and the existing infrastructure enable the use of such mobility options. Furthermore, 58.7% of respondents said that both the distance and the infrastructure conditions allow them to change their mode of transport if needed. Only 22.3% of respondents noted that rail transport could serve their leisure mobility needs. Chi-square independence analysis (value=31.085, df=8; $\alpha < 0.001$) shows that

the frequency of walking for leisure is significantly related to the respondents' level of education. Respondents with higher education levels exhibited a higher frequency of walking for leisure activities compared to other groups. Symmetric measures analysis ($\Phi=0.507$, Cramer's $V=0.358$, and contingency coefficient= 0.452) suggests that this relationship is moderate and may be influenced by the underrepresentation of respondents with education lower than secondary.

A similar pattern was observed regarding the relationship between education level and the frequency of using personal transport devices (PTDs) for leisure mobility. The Chi-square test (value= 36.769 ; $df=10$; $\alpha<0.001$) showed a significant relationship between these variables. Respondents with higher education levels were significantly less likely to use PTDs for leisure mobility than those with lower education levels. Symmetric measures ($\Phi=0.551$, Cramer's $V=0.390$, and contingency coefficient= 0.483) also indicated a moderate relationship, again likely influenced by the underrepresentation of lower-educated respondents. For other forms of leisure mobility, no significant relationship was found between usage frequency and respondents' education levels.

As part of the study, respondents were also asked whether they believe that the spatial and transportation policies of GZM and its member municipalities address residents' needs related to leisure mobility. Almost half (47.9%) positively evaluated the actions of GZM and its member municipalities, stating that leisure mobility needs are considered, while 21.5% believe these needs are not sufficiently addressed. The relatively high percentage of "No opinion" responses (30.6%) may result from respondents' insufficient knowledge about GZM's activities in shaping sustainable urban mobility.

5. Discussion and conclusions

The presented research confirms that the COVID-19 pandemic influenced the widespread adoption of remote and hybrid work, thereby impacting the available leisure time budget among young adults. The spread of remote and hybrid work required many groups to change their functioning both in private and public spaces. This, in turn, may contribute to changes in mobility patterns and daily practices related to leisure activities. Respondents observe that the remote work model facilitates an extension of leisure time, particularly the type used for short activities available locally, near one's place of residence. These activities do not require long-distance travel and can be performed using basic, more sustainable forms of mobility, such as walking. This finding is consistent with Swiss research conducted by Wöhner (2023). She indicates that remote workers are 21.5% more likely to walk and 40.3% more likely to cycle for leisure purposes compared to office-based employees. The author attributes this to three main factors: time saved on commuting,

greater spatial and temporal flexibility in organising the day, and a tendency to meet daily needs closer to home. Motte-Baumvol et al. (2025) shown that the rise of remote and hybrid working does not lead to a clear reduction in mobility but contributes to a significant reorganisation of it. This suggests that individuals working remotely are more likely to undertake daily activities near their place of residence on home-working days. Nevertheless, when people who work at least partly remotely are forced to travel for business purposes, the variety of non-work-related trips increases.

The conducted study indicates some paradoxes regarding the preferences for leisure activities among the surveyed respondents. Although 72.7% of respondents declared a noticeable increase in the need for outdoor activities, the preferred form of leisure time for them is activities carried out at the place of residence (81.8%). These results suggest that, despite the declared need to leave the house, respondents limit their mobility during leisure time. Other studies suggests that this phenomenon is not necessarily unique to the GZM area. For example, Morris et al. (2024) found that, compared to the pre-pandemic period, Americans are spending less time on outdoor activities, which may suggest that the post-pandemic trend of spending free time at home may represent a structural change rather than merely a temporary one. It should be noted that the presented study does not provide an explanation for this paradox, which points to the need for further exploration of this topic.

Among active forms of spending leisure time, respondents prefer sports or recreational activities. However, these are spatially limited to a 5 km radius from their place of residence. This may be related to the high availability of recreational areas in the GZM, which facilitates access to nearby venues for sports and outdoor activities and encourages the use of local facilities rather than longer trips (Nalej & Lewandowicz, 2024).

The relatively low use of bicycles and private transport found in this study is a cause for concern, despite the reported availability of infrastructure for these modes. This indicates a certain reluctance among respondents to use these forms of mobility; however, the study does not reveal what factors influence this attitude. This finding may serve as inspiration for further research in this area. The concentration of the respondents' leisure activities within a 5 km radius of their homes suggests that access to leisure facilities in the GZM potentially aligns with the concept of the '15-minute city' (Moreno et al., 2021), which postulates that residents should be able to meet most of their daily needs within a 15-minute walk or cycle ride from home. Future research could assess the degree to which GZM municipalities fulfil this standard in terms of residents' leisure needs.

The lack of strong relationships between leisure activity preferences and the socio-demographic characteristics of respondents may indicate a homogenization of lifestyles among young adult residents of the GZM Metropolis.

This phenomenon could be attributed to factors such as standardisation of consumption patterns or the influence of shared generational experiences (e.g. COVID-19 pandemic). At the same time, it may point to the need for further, in-depth research on the mechanisms shaping these leisure patterns among residents of highly urbanized areas, and the mobility associated with these patterns.

The finding that the greater amount of free time available to people working remotely does not necessarily translate into increased traffic during leisure hours can be explained by the relatively high availability of recreational facilities near respondents' homes, the widespread use of active forms of mobility for recreational purposes, and a tendency to spend leisure time at home. The recreational mobility of young residents of the GZM is concentrated around their place of residence, although this conclusion requires verification on a larger sample and comparison with other age groups. This is even more interesting because the residents of the Silesian Voivodeship are the third most active group in Poland in terms of the number of trips undertaken for recreational purposes [GUS, 2025].

It also remains an open question whether the observed changes in leisure mobility patterns should be interpreted as a temporary response to the pandemic or as a more structural transformation linked to the permanent adoption of hybrid and remote working models. The available data indicate an increase in the popularity of hybrid working, accompanied by a significant decline in interest in fully remote working (Grant Thornton, 2026). Also, whether the patterns identified in this study – in particular, preferences regarding forms of leisure activity and associated travel behaviour – are unique to the GZM metropolitan area or reflect broader trends in similar urban contexts remains an open question that warrants further comparative research.

The conducted study has certain limitations related to the sample size. Although the sample was proportionally selected according to the size of municipalities and age groups, it may not reflect all social aspects of the GZM Metropolis, especially in terms of income, education, or other demographic variables.

The study was exploratory in nature, and as such, it points to certain directions for future research. Future studies should focus exclusively on the analysis of leisure time mobility related to active forms of spending time. A valuable element of future research would be to combine quantitative methods (including statistical tests) with qualitative methods, which would, on the one hand, allow for the objectification of research results and, on the other hand, enable a better understanding of, among other things, the barriers associated with promoting the use of alternative means of transport for recreational travel. It would be worthwhile to expand the research by analysing the spatial location of leisure time venues and assessing the impact of this location on the commuting behaviours of GZM residents. The literature

analysis conducted indicates the possibility of extending the research in such a way as to allow cluster analysis to define existing mobility models of leisure time in the studied group (cluster analysis was used, for example, in the studies by Ohnmacht et al. (2009) and Strömblad (2024)).

Based on the results obtained, the following recommendations can be made to the GZM Metropolis and its constituent municipalities regarding the development of sustainable leisure mobility:

- Investment in high-quality walking and cycling infrastructure within a 5 km radius of residential areas should be intensified, as this corresponds to the range of recreational activities indicated by respondents; infrastructure improvements should also include better connections to parks, sports facilities, and cultural venues to encourage active mobility.
- The attractiveness of public transport for leisure travellers should be increased by tailoring services to the needs of young residents, including better connections to local leisure destinations, improved frequency during weekends and evenings, and easier access for short distance trips.
- The attractiveness of existing local venues for active leisure should be maintained and new ones created (e.g., parks, community forests, sports grounds, and cultural facilities) that are accessible within walking or cycling distance, reducing reliance on private cars and supporting active, sustainable leisure patterns.

The findings may also serve as inspiration for authorities responsible for shaping spatial policies, the development of urban areas, and sustainable urban mobility policy beyond GZM area. The research highlights the need to examine whether the available infrastructure and leisure activity offerings foster the development of an active, sustainable lifestyle among residents of urban areas. In particular, the results support the 15-minute city concept, which emphasizes that most daily and leisure needs should be accessible within a short walk or bike ride from one's home, promoting both convenience and sustainable mobility.

References

- Adamiak, C., Hall, C. M., Hiltunen, M. J., & Pitkänen, K. (2016). Substitute or addition to hypermobile lifestyles? Second home mobility and Finnish CO2 emissions. *Tourism Geographies*, 18(2), 129–151. Scopus. <https://doi.org/10.1080/14616688.2016.1145250>
- Bursa, B., Mailer, M., & Axhausen, K. W. (2022). Intra-destination travel behavior of alpine tourists: A literature review on choice determinants and the survey work. *Transportation*, 49(5), 1465–1516. ABI/INFORM Collection. <https://doi.org/10.1007/s11116-022-10267-y>

- CBOS. (2023). *Activities and experiences of Poles in 2022* [Komunikat z badań „Aktywności i doświadczenia Polaków w 2022 roku”]. https://cbos.pl/SPI-SKOM.POL/2023/K_018_23.PDF
- Ceron, J.-P., & Dubois, G. (2005). More mobility means more impact on climate change: Prospects for household leisure mobility in France. *BEL-GEO*, 1–2, 103–119. Scopus. <https://doi.org/10.4000/belgeo.12450>
- Dubois, G., & Ceron, J. P. (2006). Tourism/leisure greenhouse gas emissions forecasts for 2050: Factors for change in France. *Journal of Sustainable Tourism*, 14(2), 172–191. Scopus. <https://doi.org/10.1080/09669580608669051>
- Föbker, S., & Grotz, R. (2006). Everyday mobility of elderly people in different urban settings: The example of the city of Bonn, Germany. *Urban Studies*, 43(1), 99–118. Scopus. <https://doi.org/10.1080/00420980500409292>
- Ghadiri, Z., Mashhadi, A., Timme, M., & Ghanbarnejad, F. (2024). Recreational mobility prior and during the COVID-19 pandemic. *Communications Physics*, 7(1), 55. Coronavirus Research Database; Publicly Available Content Database. <https://doi.org/10.1038/s42005-024-01535-7>
- Gramsch-Calvo, B., & Axhausen, K. W. (2024). Exploring the influence of social relations and knowledge of the urban environment on leisure travel. *Journal of Transport Geography*, 117, 103860. <https://doi.org/10.1016/j.jtrangeo.2024.103860>
- Grant Thornton. (2026). *Remote work through the eyes of entrepreneurs: How company boards assess remote work and whether they plan changes in this area in 2026? Edition III* [Praca zdalna okiem przedsiębiorców: Jak pracę zdalną oceniają zarządy firm i czy planują w tym obszarze zmiany w 2026 r.? Edycja III]. <https://grantthornton.pl/wp-content/uploads/2026/02/Praca-zdalna-okiem-przedsiębiorcow-2026-edycja-III.pdf> (Retrieved: 31.03.2026).
- Grubbe, M., & Otto, S. (2011). *Impacts and special drivers of Leisure Mobility*. https://www.researchgate.net/profile/Magnus-Grubbe/publication/260403559_Impacts_and_special_drivers_of_Leisure_Mobility/links/53e1ff2b0cf2d79877a9fca1/Impacts-and-special-drivers-of-Leisure-Mobility.pdf (Retrieved: 6.10.2025)
- GUS. (2023). *Tourism in 2022* [Turystyka w 2022 roku]. Statistics Poland. <https://stat.gov.pl/obszary-tematyczne/kultura-turystyka-sport/turystyka/turystyka-w-2022-roku,1,20.html>
- GUS (2025). *Passenger mobility in Poland in 2024* [Mobilność transportowa ludności w Polsce w 2024 r.]. Statistics Poland. <https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/mobilnosc-transportowa-ludnosci-w-polsce-w-2024-r-,17,1.html>
- Jansson, M., & Sunding, A. (2024). Children’s everyday recreational mobilities – growing up in a densifying Swedish small town. *Local Environment*, 29(6), 705–721. <https://doi.org/10.1080/13549839.2024.2325079>

- Juschten, M., & Hössinger, R. (2021). Out of the city – but how and where? A mode-destination choice model for urban–rural tourism trips in Austria. *Current Issues in Tourism*, 24(10), 1465–1481. <https://doi.org/10.1080/13683500.2020.1783645>
- Juschten, M., & Preyer, B. (2023). Exploring constraints and coping strategies of outdoor recreation trips accessible by public transport: A walk-along and ride-along study in Austria. *Journal of Outdoor Recreation and Tourism*, 43, 100669. <https://doi.org/10.1016/j.jort.2023.100669>
- King, K., Tråsavik, H. & Sareen, S. (2024). Take a hike: Spatializing allemannsretten and transportation accessibility for outdoor recreation in the Greater Stavanger Region, Norway. *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography*, 78(5), 324–337. <https://doi.org/10.1080/00291951.2024.2412862>
- Kos, B., Krawczyk, G., Mercik, A., & Tomanek, R. (2021). *Urban mobility during the COVID-19 pandemic* [Mobilność miejska w czasie pandemii COVID-19]. Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach.
- Le-Klähn, D.-T., & Hall, C. M. (2015). Tourist use of public transport at destinations – a review. *Current Issues in Tourism*, 18(8), 785–803. <https://doi.org/10.1080/13683500.2014.948812>
- Łukaszewski, B. (2020). Free time of Poles in the context of tourism potential [Czas wolny Polaków w kontekście potencjału turystycznego]. *Zeszyty Naukowe. Turystyka i Rekreacja*, 1(25), 139–157. <http://cejsh.icm.edu.pl/cejsh/element/bwmeta1.element.desklight-17644342-458a-4593-b97f-da1c7f8df67c>
- Mendyk, E. (2009). *Transport economics* [Ekonomika transportu]. Wyższa Szkoła Logistyki.
- Moreno, C., Allam, Z., Chabaud, D., Gall, C., & Pratlong, F. (2021). Introducing the “15-Minute City”: Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities. *Smart Cities*, 4(1), 93–111. <https://doi.org/10.3390/smartcities4010006>
- Morris, E. A., Speroni, S., & Taylor, B. D. (2024). Going nowhere faster: Did the Covid-19 pandemic accelerate the trend toward staying home? *Journal of the American Planning Association*, 91(3), 361–379. <https://doi.org/10.1080/01944363.2024.2385327>
- Motte-Baumvol, B., Rérat, P., & Ravalet, E. (2025). The mobility paradox of telework: Reduction, reorganization, and rebound. *SSRN*. <https://doi.org/10.2139/ssrn.5723428>
- Nalej, M., & Lewandowicz, E. (2024). An Analysis of Recreational and Leisure Areas in Polish Counties with the Use of Geographically Weighted Regression. *Sustainability*, 16(1), 380. <https://doi.org/10.3390/su16010380>
- Næss, P. (2006). Are short daily trips compensated by higher leisure mobility? *Environment and Planning B: Planning and Design*, 33(2), 197–220. Scopus. <https://doi.org/10.1068/b31151>

- Nessi, H. (2017). Leisure mobility and individuals' relationship to the living environment: A comparison between the Paris and Rome urban regions. *Environnement Urbain / Urban Environment, Volume 12*, Article Volume 12. <https://journals.openedition.org/eue/2034>
- Normark, D. (2023). Recreational mobility on a busy street: Visual studies of alterity by doing jogging and doing dog-walking. *Mobilities, 18*(5), 756–772. <https://doi.org/10.1080/17450101.2023.2220943>
- Ohnmacht, T., Götz, K., & Schad, H. (2009). Leisure mobility styles in Swiss conurbations: Construction and empirical analysis. *Transportation, 36*(2), 243–265. Scopus. <https://doi.org/10.1007/s11116-009-9198-8>
- Östh, J., Toger, M., Türk, U., Kourtiti, K., & Nijkamp, P. (2023). Leisure mobility changes during the COVID-19 pandemic – An analysis of survey and mobile phone data in Sweden. *Research in Transportation Business and Management, 48*. Scopus. <https://doi.org/10.1016/j.rtbm.2023.100952>
- Shakeel, K., Wijayarathna, K., Barbieri, D. M., Lou, B., & Rashidi, T. H. (2023). Mobility perceptions regarding the COVID-19 pandemic from around the world. *Travel Behaviour and Society, 33*, 100631. <https://doi.org/10.1016/j.tbs.2023.100631>
- Strömblad, E. (2024). Identifying mobility segments for leisure travel: A cluster analysis based on a one-month travel survey. *Transportation Research Part A: Policy and Practice, 181*, 104001. <https://doi.org/10.1016/j.tra.2024.104001>
- Talavera-Garcia, R., Perez-Campana, R., & Cara-Santana, Y. (2023). Unveiling the pandemic's impact on visits to Madrid's parks: Insights from mobile phone data analysis. *Journal of Maps, 19*(1), 2274466. <https://doi.org/10.1080/17445647.2023.2274466>
- Toger, M., Türk, U., Östh, J., Kourtiti, K., & Nijkamp, P. (2023). Inequality in leisure mobility: An analysis of activity space segregation spectra in the Stockholm conurbation. *Journal of Transport Geography, 111*, 103638. <https://doi.org/10.1016/j.jtrangeo.2023.103638>
- Tomej, K., & Liburd, J. J. (2020). Sustainable accessibility in rural destinations: A public transport network approach. *Journal of Sustainable Tourism, 28*(2), 222–239. <https://doi.org/10.1080/09669582.2019.1607359>
- Transport study of the Central Subregion of the Silesian Voivodeship* (2020). [Studium Transportowe Subregionu Centralnego Województwa Śląskiego]. <https://subregioncentralny.pl/zit-2014-2020/mobilnosc-1/studium-transportowe-subregionu-centralnego-wojewodztwa-slaskiego>
- Tråsavik, H. S., Loe, M. R., King, K., & Sareen, S. (2024). Leisure mobility: Situating emotional geographies of *friluftsliv* in urban mobility transitions. *Emotion, Space and Society, 50*, 101003. <https://doi.org/10.1016/j.emospa.2024.101003>
- Türk, U., Toger, M., Östh, J., Kourtiti, K., & Nijkamp, P. (2025). Rural Feet Voting of Leisure Explorers. *International Journal of Tourism Research, 27*(1), e70003. <https://doi.org/10.1002/jtr.70003>



- Wöhner, F. (2023). Work flexibly, travel more healthily? How telework and flextime affect active travel in Switzerland. *Transportation Research Part A: Policy and Practice*, 174, 103748. <https://doi.org/10.1016/j.tra.2023.103748>
- Wojewódzka-Król, K., & Załoga, E. (Eds.). (2016). *Transport – new challenges* [Transport – nowe wyzwania]. Wydawnictwo Naukowe PWN.

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Note: Preliminary findings from this research were presented at the 13th International Conference On Applied Economics Contemporary Issues in Economy 2025.

Appendix

Table 1. Characteristic of respondents

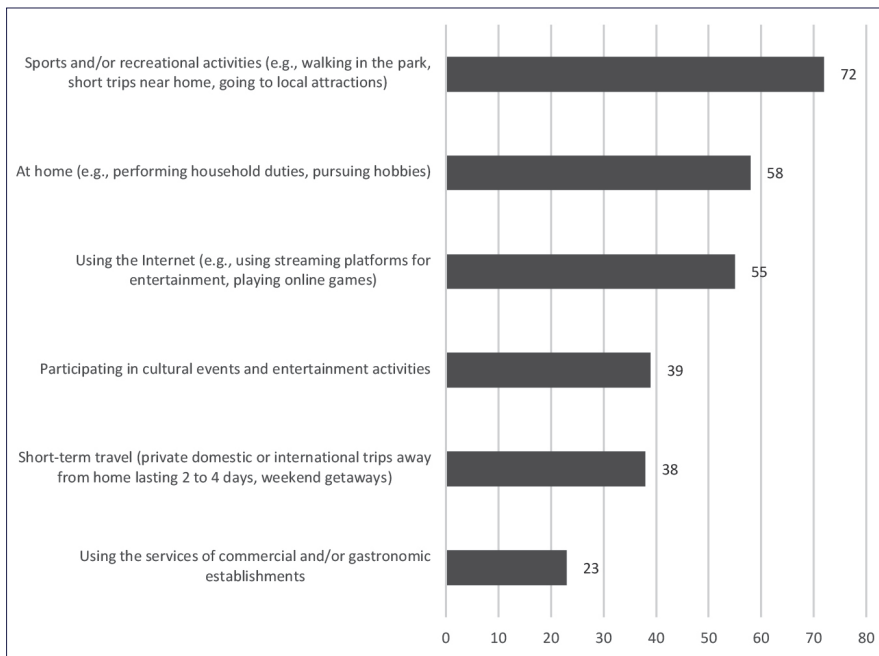
		Frequency	% of responses
Age:	19–24	38	31,4
	25–34	83	68,6
Gender:	Female	66	54,5
	Male	55	45,5
Level of education:	Vocational education	2	1,7
	Secondary education	47	38,8
	Higher education	72	59,5
The amount of average monthly gross income per household member:	Up to 2500 (PLN)	5	4,1
	2500–3500 (PLN)	19	15,7
	3500–4500 (PLN)	24	19,8
	4500–5500 (PLN)	20	16,5
	Above 5500 (PLN)	34	28,1
	Refusal to respond	19	15,7



		Frequency	% of responses
Place of residence:	Municipality with less than 10 thousand inhabitants	9	7,4
	Municipality from 10 to 50 thousand inhabitants	18	14,9
	Municipality from 50 to 100 thousand inhabitants	18	14,9
	Municipality with more than 100 thousand inhabitants	76	62,8
Work performance model:	Only stationary at the place of employment	54	44,6
	Mainly stationary at the place of employment, occasionally remotely	13	10,7
	Half stationary, half remote	16	13,2
	Mainly remotely, occasionally stationary	25	20,7
	Remote only	4	3,3
	Currently unemployed	9	7,4
Total:		121	100

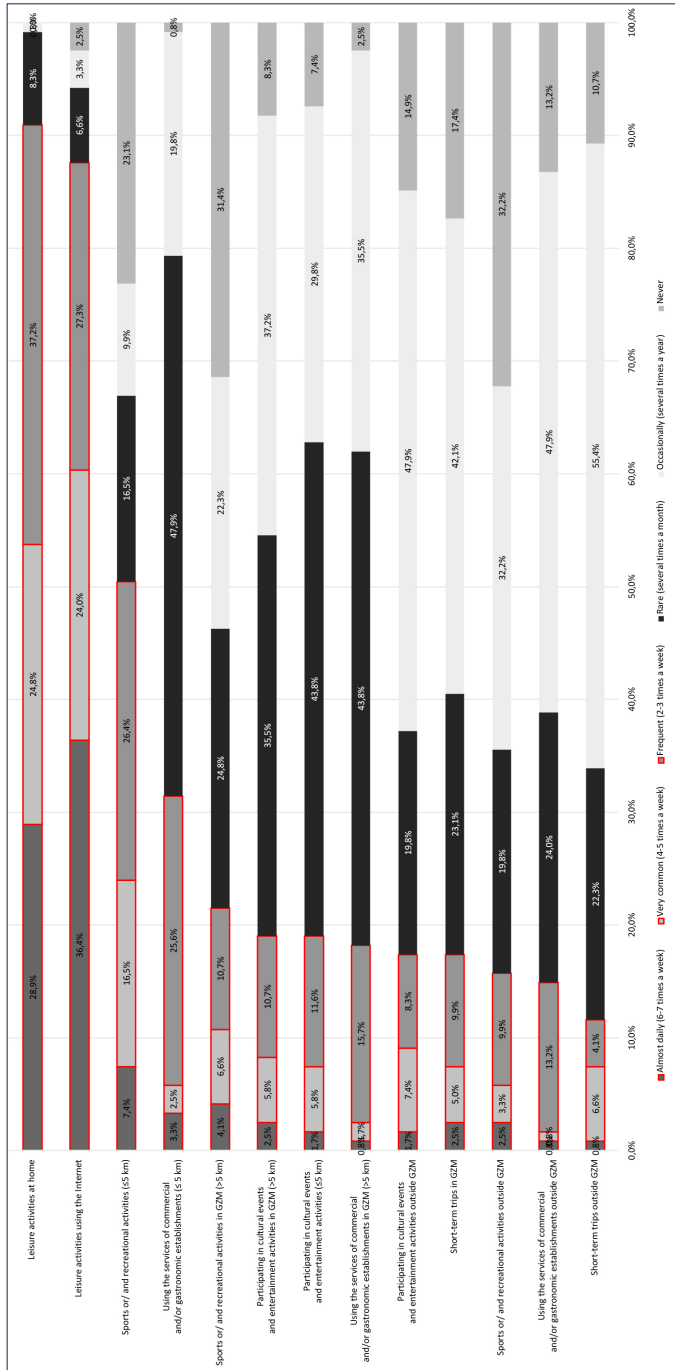
Source: own study.

Figure 1. Respondents' preferences regarding ways of spending leisure time (number of re-sponses)



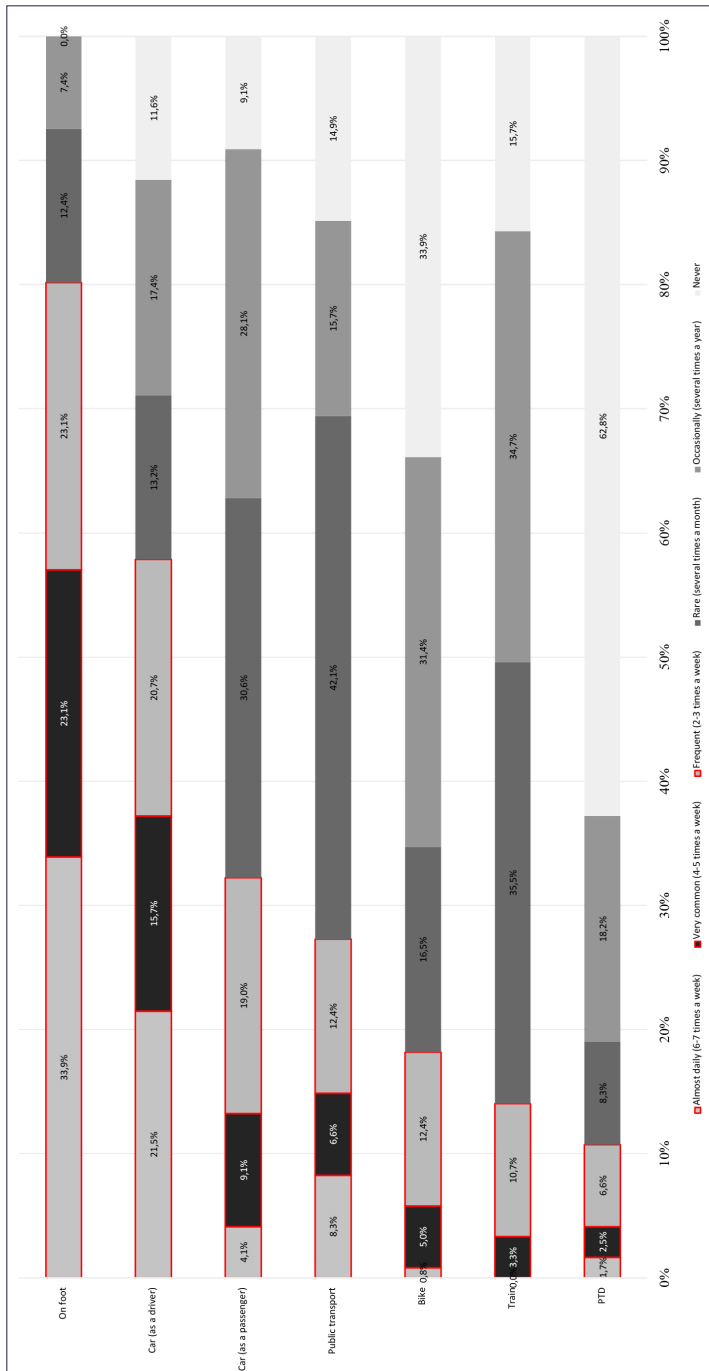
Source: own study.

Figure 2. Declared frequency and distance of leisure activities



Source: own study.

Figure 3. Declared frequency of using different mobility models during leisure time



Source: own study.



Revenue of municipalities located in protected areas and their tourism potential

JOANNA KUDEŁKO

Department of Economic Policy and Development Programming, College of Economics and Finance, Krakow University of Economics, Rakowicka Street 27, 31-510 Cracow

✉ kudelkoj@uek.krakow.pl

 ORCID: 0000-0002-8430-2377

MONIKA MUSIAŁ-MALAGO'

Department of Socio-Economic Geography, College of Public Economy and Administration, Krakow University of Economics, Rakowicka Street 27, 31-510 Cracow

✉ musialm@uek.krakow.pl

 ORCID: 0000-0002-4620-1954

Abstract

Motivation: Protected areas possess unique and prized natural, landscape, scientific, and socio-cultural resources and values. The natural conditions present in a given area are becoming an increasingly important factor in determining the development opportunities of individual territories. On the other hand, protected areas restrict economic activity and market opportunities. This can affect the well-being of local communities that live and work in these areas. Nevertheless, the majority of the available studies proves the positive impact of the operation of protected areas on the socio-economic development of local communities, income growth, and employment levels. The main factor in these positive effects is the possibility of a more intensive development of tourism and recreational services.

However, municipalities covered by protected areas do not constitute a uniform group of entities, representing considerable diversity in terms of development, which is measured by the revenue of budget of local units.

The identification of the various factors influencing the revenue levels of municipalities covered by protected areas is essential for development policy planning and formulating local strategies

Aim: The aim of the article is to assess the variation in revenue of different types of rural municipalities within protected areas, as well as to evaluate the relationship between the municipalities' own revenues earned and their tourism potential.

Results: Municipalities within protected areas develop in different ways. This article addresses the relatively rarely discussed issue of revenue differentiation among rural municipalities within protected areas and the relationship between revenue and their tourism potential.

Keywords: diversification of municipalities; protected areas, revenue of municipalities, tourism

JEL: O18; O44; R12; Z32

1. Introduction

The fundamental goals of establishing protected areas are to protect the environment, prevent the loss of biodiversity, and prevent climate change. However, in addition to direct environmental goals, protected areas can also be a factor in local development and contribute to poverty reduction.

The world literature contains the results of studies on the impact of protected areas' operation on the socio-economic development of land located within their borders and in their vicinity. Based on the analysis of selected case studies, the authors analyze the impact of protected areas on local communities. The studies cover tourist spending and their impact on business development and job creation (Braber et al., 2018; Rauf et al., 2020; Sang et al., 2018; Siltanen et al., 2023; Yergeau, 2020).

Other studies list the negative aspects of protected areas, related to the restriction of economic activities within them (D'Alberto et al., 2023; Rodríguez-Rodríguez & López, 2020). The authors also address the management of protected areas and the participation of the population, in this process (Anthony, 2007; Bennett & Dearden, 2014; Buono et al., 2012; White et al., 2002, Young et al., 2008).

This article proposes a slightly different approach to studying the effects of protected areas on local communities. It focuses on the study of the own revenue of municipalities the land of which is under environmental protection. The subject of the study are rural municipalities in Poland within national parks and landscape parks. These parks are a form of protection for large, cohesive areas with special natural and landscape values.

The main objective of the article is to assess the revenue differentiation of different types of rural municipalities within protected areas, as well as

to evaluate the relationship between the earned own revenue and the tourism potential of municipalities. The main objective was further clarified by formulating specific objectives, which include:

1. Assessment of the revenue level of rural municipalities within national parks and landscape parks, compared with other municipalities in Poland;
2. Assessment of revenue variation of different types of rural municipalities within protected areas;
3. Assessment of the relationship between the revenue of rural municipalities included in protected areas and their tourism potential.

Local fiscal outcomes are central not only to understanding the development effects and constraints associated with environmental protection, but also to analysing the incentive structures faced by local stakeholders. Municipal revenues can shape local acceptance, political support, and governance arrangements related to the designation and management of protected areas.

Moreover assessment of revenue variation of different types of rural municipalities, and the examination of tourism as a key transmission channel allow to highlight potentially informative development patterns.

The analysis focused on two types of protected areas: national parks and landscape parks, which play a central role in the system of protected areas. They hold a particularly important place due to their unique and prized natural, landscape, scientific, socio-cultural, and educational resources and values, as well as relatively large unit areas and importance for the socio-economic development of protected areas.

Research on the factors influencing the formation of rural municipalities' revenue in Poland is timely and important. Rural municipalities usually show a lower level of development than urban-rural or urban municipalities. Many significant development problems accumulate on their territory, and residents of rural municipalities tend to have fewer job opportunities and worse access to technology, infrastructure, and services. The occurrence of areas of natural value is a part of the character of rural municipalities and can be a potential for generating revenue for these units, and stimulate their development.

The study used descriptive statistics methods, the comparative analysis method, using the Kruskal-Wallis non-parametric test, and the correlation analysis method using Spearman's rank correlation coefficient. The statistical data used in the research came from the official source of verified statistical information, i.e. the Statistics Poland office, and from the Local Data Bank database. The research was conducted with reference to the state in 2023.

The next part of the article includes a literature review. The review is followed by a discussion of the research methodology used. Afterwards the authors present the results of the research, which include conclusions about the level of revenue of rural municipalities within national parks and

landscape parks in comparison with municipalities outside of these types of nature protection. The next part is an assessment of the revenue differentiation of different types of rural municipalities within protected areas. The presentation of the research results ends with the results of the analysis of the relationship between the revenue of the studied municipalities and their tourism potential. This is followed by a discussion of the obtained research results. The last part of the article contains conclusions.

2. Literature review

2.1. The socio-economic consequences of establishing protected areas

Protected areas have unique and prized natural, landscape, and socio-cultural resources and values. The natural conditions found in an area are becoming an increasingly important factor in determining the development capabilities of individual territories.

Establishing protected areas can have both positive and negative consequences due to the way these entities operate. Most studies prove the positive impact that protected areas can have, not only in terms of environmental sustainability, but also on the socio-economic development of communities and local economies, growth of employment and income of the population, and poverty reduction (Fan, 2022; Getzner, 2010; Kandel et al., 2022).

The impact of protected areas in various countries is most often viewed through the lens of economic effects related to tourism development and recreational activities (Bittlingmaier et al., 2021; Byström & Müller, 2014; Meyer et al., 2010; Zawilińska & Mika, 2015). Tourist spending supports a significant portion of economic activity (Meehan, 2014; Sang et al., 2018; Yergeau, 2020), giving impetus to the development of sectors such as accommodation, catering, retail and entertainment (Stynes, 2011). Owing to the benefits associated with tourism development, these areas have seen an increase in the number of jobs, which affects income and improves the quality of life (Alló et al., 2010; Bennett et al., 1996; Braber et al., 2018; Rauf et al., 2020; Saayman & Saayman, 2006; Siltanen et al., 2023), lowering poverty rates of the local community (Thomas et al., 2014), as well as the population living outside the protected area (Fredman & Yuan, 2011).

The negative effects of protected areas include, but are not limited to: a decrease in the income of the population and an increase in poverty caused by reduced access to the use of natural resources in protected areas (Moore et al., 2016; Withey et al., 2018) or economic losses caused by wild animals (Vedeld et al., 2012; Mojo et al., 2020).

Among the constraints are also those caused by regulations in protected areas. This is especially true for areas with a high regime of nature protec-

tion. From an ecological point of view, this guarantees the preservation of their natural resources and biodiversity, serves to protect or reduce the degradation of habitats and ecosystems, and increase the biomass and diversity of species. On the other hand, it determines the direction of economic activities and significantly limits their scope within the boundaries of protected areas (Kószegi et al., 2022; Etxano, 2010; Jaros, 2015; Rodríguez-Rodríguez & López, 2020). Restrictions and prohibitions adversely affect opportunities for local businesses (D'Alberto et al., 2023). These constraints usually affect representatives of agriculture, forestry, timber industry, hunting associations or fisheries (Robertson et al., 2020). In addition, placing an area under legal protection and thus imposing restrictions on its use is a barrier to the development of construction (Etxano, 2010) and infrastructure or additional economic activities (D'Alberto, et al., 2020).

The literature also addresses the participation of local people in nature and landscape conservation planning, policy formulation and management of conservation areas (Anthony, 2007). The involvement of local communities in the management of protected areas has become widely recognized and seen as an indicator of sustainable practices (Buono et al., 2012).

2.2. System of protected areas in Poland

Poland's system of protected areas is defined in the Nature Conservation Act and consists of 10 forms of protection (Law on nature protection, 2004). Protected areas are distinguished by the abundance of environmental resources, their unique character, rules of operation and status. Each form has specific conservation objectives and designated functions. Protected areas include: national parks, nature reserves, landscape parks, areas of protected landscape, Natura 2000 areas, ecological areas, nature monuments, documentation sites and natural and landscape complexes, as well as species protection of plants, animals and fungi (Law on nature protection, 2004). In total, Poland's legally protected areas cover 32.3% (LDB, accessed 12.04.2025).

The largest acreage of protected area in Poland is occupied by Natura 2000 areas (27.1%). This is followed by areas of protected landscape with a share of 22.3% and landscape parks (8.3%) (Table 1). A particularly important place in the system of protected areas due to the highest protection requirements in force, is held by national parks and nature reserves. In 2023, national parks covered a total of 315,237.40 hectares, which was about 1% of the country's area and covered only 3.1% of all protected areas (LDB, accessed 12.04.2025).

National parks are areas with unique and prized natural, landscape, scientific, socio-cultural, and educational resources and values. They occupy areas of no less than 1,000 hectares, where all nature is protected (Law on nature protection, 2004).

National parks are of the greatest importance for the socio-economic development of protected areas due to their valuable natural environment, high protection regime, and relatively large unit areas. The purpose of their creation is to preserve and protect biodiversity, natural and cultural resources and values, to restore degraded or otherwise lost elements, and to make the area available to the population for educational and tourism purposes. The first park established in the world was Yellowstone National Park, in the United States, it was established in 1872. In Europe, the first country where this form of protection was introduced was Sweden. In 1909, a network of ten national parks was established on its territory.

There are 23 national parks in Poland. All of them are included in Natura 2000 areas designated at the European level for the protection of natural habitats, plant and animal species. They are the most valuable natural places in Poland. The oldest Polish national park is the Białowieża National Park, established in 1932.

Another form of nature protection is landscape parks. These areas are distinguished by their special natural, historical, cultural and landscape values. They are created to popularize these resources, assuming the principles of sustainable development, i.e. social and economic development that preserves the values and resources of the environment in a state that ensures both present and future generations the permanence of their use (Law on nature protection, 2004). With this form, the aim is to protect natural and landscape values from destruction and degradation. Landscape parks are treated as multifunctional areas, but above all they are attractive places for tourists due to their natural values and numerous tourist attractions. Thus, one of the most important functions they fulfill, in addition to nature and landscape protection, is the tourist function. It is characteristic of landscape parks to leave agricultural land, forest land and other properties in economic use. However, it should be noted that the use of these areas is limited to activities that ensure non-deterioration of the environment. The basic principle, however, is the possibility of sustainable use of the properties that are included in the acts establishing the parks. As of the end of 2023, 126 landscape parks with a total area of 2.6 million hectares had been established, covering 8.3% of the country's area.

National parks and landscape parks are located within the borders of 915 municipalities, respectively, and cover a total area of 315,000 hectares. Among the municipalities affiliated with the national parks, 236 have the status of an urban municipality, 230 have the status of an urban-rural municipality, while 449 have the status of a rural municipality.

3. Methods

In accordance with the specific objective (1), the first stage of the study assessed the level of revenue of rural municipalities within the areas of national parks and landscape parks, compared to other municipalities in Poland. To achieve this goal, a comparative analysis was conducted using statistical tests.

Selected types of municipal income were examined, i.e.:

- total own revenue per capita in PLN,
- revenue from shares in income taxes from individuals constituting revenue of the state budget per capita in PLN,
- revenue from shares in income taxes from legal entities constituting revenue of the state budget per capita in PLN,
- revenue from tax on business activity of individuals, paid in the form of tax card per capita in PLN,
- revenue derived from agricultural tax per capita in PLN,
- revenue derived from forestry tax per capita in PLN.

Municipalities' own revenue, including, in particular, revenue from taxes on individuals and legal entities, constituting municipalities' shares in taxes of the state budget, as well as revenue from tax on economic activity of individuals, carry important information on the economic condition of the municipality. These indicators are measures of the wealth of the residents of municipalities and the effects of economic activity, and also indirectly inform about the level of development of these territorial units. Revenues derived from agricultural tax carry information on the ability to use the potential of the countryside from agricultural activities, while revenues derived from forestry tax testify to the ability to use the natural potential of forest areas.

Three types of municipalities were analyzed for comparison:

- Rural municipalities within national parks,
- Rural municipalities within landscape parks,
- The rest of Poland's rural municipalities outside of park protection.

An assessment of the differentiation of municipalities in terms of the indicated types of revenue was carried out, comparing them in three groups of municipalities, separated according to the Delimitation of Rural Areas developed by Statistics Poland:

- Agglomeration rural municipalities – rural areas located within the functional areas of provincial cities and other cities with a population of at least 150 thousand,
- High-density non-agglomeration rural municipalities – municipalities located outside the boundaries of the functional areas of the above-mentioned cities, with a population density greater than 1/3 of the population density of Poland,

- Rural non-agglomeration low-density municipalities – municipalities located outside the boundaries of the functional areas of the above-mentioned cities, with a population density equal to or less than 1/3 of the population density of Poland.

Conducting surveys separately for each of the aforementioned groups is related to the fact that rural areas are not homogeneous units, but their specificity is related to their location, population density, and the performed economic function resulting from these characteristics. Comparing all municipalities together without taking into account these peculiarities could lead to results with insufficient precision.

For the same reason, in order to maintain the precision and comparability of the results, it was decided to select only rural municipalities for the analysis, excluding urban-rural and urban municipalities from the study, the incomes of which depend on factors different than those of rural municipalities. It should also be noted that the method of presentation of official data for urban-rural municipalities does not include a division of revenue into urban and rural parts.

The comparative analysis was performed using the methodology appropriate for the statistical procedure - one-way analysis of variance ANOVA. The purpose of this statistical method is to test the significance of differences between several means for samples from multiple populations. ANOVA makes it possible to determine whether the variation of distinguished functional groups in terms of the characteristics under study, has its origin in the variation between groups or in the variation within these groups. One-way analysis of variance ANOVA is a parametric test. Therefore, the variables under study must meet certain conditions, i.e. the condition of normality of the dependent variable distribution in each group and the condition of homogeneity of variance across groups.

The condition for normality of distribution of the variable in groups was tested with the Kolmogorov-Smirnov normality test. The homogeneity of variance was tested with Levene's test.

In the analyzed cases, the conditions of normality of the variable distribution and homogeneity of variance were not met, Therefore, in accordance with the rules of conduct in such cases, Fisher's classical statistics were replaced with a non-parametric test – the Kruskal-Wallis rank test, which corrects distribution distortions resulting from the occurrence of extreme results that could artificially increase or decrease the mean.

In the second stage of the research, in order to achieve specific objective (2), internal revenue differentiation in municipalities within national parks and landscape parks was assessed. It was assumed that park municipalities are not a homogeneous group of units. The search for criteria that differentiate them makes it possible to obtain information on the factors that affect the revenue they receive.

First, the differences between incomes in the covered municipalities, appearing according to their location and population density, were recognized. Thus, agglomeration municipalities, high-density non-agglomeration municipalities and low-density non-agglomeration municipalities were compared with each other.

Next, the variation among park municipalities was examined, taking into account the criterion of the share of park-covered area in the total area of municipalities. For the purposes of the study, three groups of municipalities were distinguished:

- Municipalities where the protected area covers less than 10% of the area,
- Municipalities where the share of the municipal area covered by a park is in the range [10%, 40%),
- Municipalities where the protected area covers more than 40% of the total area.

Kruskal-Wallis non-parametric tests were used in the research procedure.

In the third stage of the research, pursuing specific objective (3), the relationship between the revenue of rural municipalities within protected areas and their tourism potential was assessed.

The choice of features depicting the tourism potential of the surveyed municipalities was dictated by their substantive value, and the availability of data at the municipal level. These include:

- national economy entities registered in the REGON register in Section I per 10 thousand residents,
- natural persons running economic activities in Section I per 10,000 residents,
- legal persons and organizational entities without legal personality in Section I per 10 thousand residents,
- national economy entities registered in the REGON register in Section I Subsection 55 per 10 thousand residents,
- national economy entities registered in the REGON register in Section I Subsection 56 per 10 thousand residents,
- tourist function of the municipality – the number of tourist accommodations per 1,000 residents,
- accommodation density index – the number of beds per 100 km².

According to the Polish Classification of Activities, Section I classifies accommodation and food service activities, and thus includes enterprises operating in the broadly defined tourism industry. Section I identifies Subsection 55 – Accommodation, which includes the activities of hotels and other accommodation facilities, as well as Subsection 56 – Food and beverage service activities, which includes the activities of restaurants and other catering establishments.

In the course of the research process, the relationship between the own revenue of municipalities within national parks and landscape parks, and the mentioned characteristics was investigated. To examine the existence and strength of the relationship between these categories, correlation analysis was applied using Spearman's rank correlation coefficient, adequate for use in this study. This is because Spearman's rank correlation coefficient is used to measure the strength of the relationship between variables when the number of variants of measurable characteristics is small. In addition, it does not condition the normality of the distributions of these characteristics.

The relationship between the level of municipalities' own revenue and their tourism potential was studied for municipalities grouped by different location and population density (agglomeration and non-agglomeration), as well as for municipalities grouped by the criterion of the share of protected areas in their total area.

4. Results

4.1. Revenue level of rural municipalities, within national parks and landscape parks, compared to other rural municipalities in Poland

To achieve specific objective (1), concerning the assessment of the level of revenue of rural municipalities within protected areas, i.e. national parks and landscape parks, compared to other municipalities in Poland, a comparative analysis was carried out using the Kruskal-Wallis rank-sum test. The analysis was carried out separately for three groups of municipalities, i.e. agglomeration municipalities, high-density non-agglomeration municipalities and low-density non-agglomeration municipalities.

The results of the analysis show that no statistically significant differences can be found in any of the analyzed groups between municipalities within and not outside of protected areas in terms of own revenue and in terms of revenue derived from shares of corporate income taxes constituting state budget revenues (Table 2).

On the other hand, significant statistical differences were observed with regard to revenue derived from shares in personal income taxes constituting state budget revenues, but only in the group of high-density non-agglomeration municipalities (the Kruskal-Wallis test yielded: $\chi^2 = 16.892 \sim \chi^2(2)$; $p < 0.01$). In this group, the highest revenue from personal taxes was recorded in municipalities within landscape parks, slightly lower in municipalities within national parks, and the lowest in municipalities outside of protected areas.

In addition, high-density non-agglomeration municipalities show differences in terms of revenue derived from business activity of individuals, paid

in the form of tax card ($\chi^2 = 6.167 \sim \chi^2(2)$; $p < 0.05$). The highest revenues were generated by municipalities within national parks, while the other two groups of municipalities generated lower revenues and showed no statistically significant differences between them. In terms of personal business tax, low-density non-agglomeration municipalities also differed significantly ($\chi^2 = 5.991 \sim \chi^2(2)$; $p < 0.05$). Also in this group, the highest values were recorded in municipalities within national parks, and the values are significantly different from other groups of municipalities.

Non-agglomeration municipalities of high and low density are also varied in terms of revenue from forest tax (test results, respectively: $\chi^2 = 61.887 \sim \chi^2(2)$; $p < 0.01$; $\chi^2 = 27.647 \sim \chi^2(2)$; $p < 0.01$). In the case of high-density non-agglomeration municipalities, the highest forest tax revenues were earned by municipalities outside of protected areas, followed by municipalities with landscape parks and national parks. In contrast, in the case of low-density non-agglomeration municipalities, municipalities within national parks were at the top, followed by municipalities within landscape parks, and finally other municipalities.

It was further observed that the type of revenue that statistically significantly differentiates all the analyzed types of municipalities is agricultural tax revenue. In each group of municipalities, i.e. agglomeration ($\chi^2 = 9.487 \sim \chi^2(2)$; $p < 0.01$), non-agglomeration high density ($\chi^2 = 41.868 \sim \chi^2(2)$; $p < 0.01$) and low density ($\chi^2 = 26.368 \sim \chi^2(2)$; $p < 0.01$), municipalities outside of protected areas are leading the way in this regard, differing significantly from park municipalities.

4.2. Assessment of internal variations within rural municipalities within protected areas

In line with the specific objective (2), the revenue differentials of different groups of rural municipalities within national parks and landscape parks were assessed.

As the first step, the differences between incomes in municipalities within protected areas were recognized. These differences appeared depending on location and population density. Thus, agglomeration municipalities, non-agglomeration high-density municipalities and non-agglomeration low-density municipalities were compared with each other (Table 3).

Location and population factors differentiate national park municipalities in terms of most types of revenue analyzed in a statistically significant manner. Agglomeration municipalities show own revenues to be statistically significantly higher ($\chi^2 = 9.108 \sim \chi^2(2)$; $p < 0.05$) than non-agglomeration municipalities, and within these own revenues, also the revenue raised from personal taxes ($\chi^2 = 19.838 \sim \chi^2(2)$; $p < 0.01$). Statistically significant differences exist also between national park municipalities in agricultural

tax revenues ($\chi^2 = 26.5 \sim \chi^2(2)$; $p < 0.01$) and forestry tax revenues ($\chi^2 = 40.525 \sim \chi^2(2)$; $p < 0.01$). The highest revenues from these two types of taxes were received by low-density non-agglomeration municipalities.

Similar findings apply to municipalities within landscape parks. Also in their case, the revenue of agglomeration municipalities is higher by a statistically significant value than that of non-agglomeration municipalities in terms of total own revenue ($\chi^2 = 9.898 \sim \chi^2(2)$; $p < 0.01$), revenue coming from income taxes from natural persons ($\chi^2 = 92.295 \sim \chi^2(2)$; $p < 0.01$), revenue derived from income taxes from legal persons ($\chi^2 = 12.102 \sim \chi^2(2)$; $p < 0.01$), and revenue derived from tax on economic activity of natural persons paid by tax card ($\chi^2 = 19.071 \sim \chi^2(2)$; $p < 0.01$). Non-agricultural low-density municipalities led the way in terms of revenue derived from agricultural tax ($\chi^2 = 45.101 \sim \chi^2(2)$; $p < 0.01$) and from forest tax ($\chi^2 = 147.754 \sim \chi^2(2)$; $p < 0.01$).

However, it should be noted that the important issue is the spatial distribution of protected areas. Differences observed across groups may partly reflect regional patterns rather than effects related to protected status. (tab. 4). In particular agglomeration municipalities within protected areas are geographically concentrated in a limited number of regions, mainly in the most developed regions: Mazowieckie, Małopolskie and Śląskie.

Interesting results were provided by the study of variations between different groups of park municipalities, formed according to the criterion of the share of park-covered area in the total area of municipalities (Table 5).

There are no statistically significant differences between municipalities with different acreage of protected areas in terms of most of the types of revenue analyzed, i.e. total own revenue, revenue derived from shares of taxes constituting state budget revenue, and revenue derived from personal business tax.

For both national park and landscape park municipalities, statistically significant differences existed only with regard to revenue derived from agricultural taxes (test result, respectively: $\chi^2 = 7.339 \sim \chi^2(2)$; $p < 0.05$; $\chi^2 = 15.337 \sim \chi^2(2)$; $p < 0.01$). Municipalities with the smallest acreage (up to 10% of the area) had the highest revenues. These municipalities differed significantly from the other two groups, for which no statistically significant differences were found.

In addition, there were statistically significant differences for municipalities within landscape parks in terms of revenue derived from forest tax ($\chi^2 = 13.268 \sim \chi^2(2)$; $p < 0.01$). Higher revenues from this source were drawn by municipalities where the protected areas cover more than 40% of the total area, while no differences were found between the other groups.

4.3. Assessing the relationship between the revenue of rural municipalities within protected areas and their tourism potential

An interesting aspect in the search for factors related to the level of revenue of municipalities within national and landscape parks, is the study of their relationship with indicators depicting the tourism potential of municipalities, which is another specific objective (3) of the article. These relationships were studied for municipalities grouped by different location and population density (Table 6) and municipalities grouped by the criterion of the share of protected areas in their total area (Table 7).

Among the units within national parks, own revenues of non-agglomeration municipalities show stronger relationships with the characteristics depicting tourism potential than own revenues of agglomeration municipalities. In non-agglomeration municipalities, all values of the correlation coefficient between own revenues and the selected characteristics related to their tourism potential reached high positive values indicating a strong correlation of the studied characteristics. The results of the correlation analysis were statistically significant at the level of 0.01. In non-agglomeration municipalities, the strongest relationship was recorded between the level of own revenues and the number of entities registered in the REGON register in Section I, which includes accommodation and food service activities (the value of the correlation coefficient was 0.64 for low-density municipalities and 0.58 for high-density municipalities), with a stronger relationship recorded for Subsection 56, concerning food and beverage service activities (correlation coefficient at 0.62 for these two groups of municipalities) and a slightly weaker one for Subsection 55, covering accommodation activities (0.58 for low-density municipalities and 0.50 for high-density municipalities). The level of own revenue correlates strongly with the tourist function of these municipalities, as measured by the number of tourist accommodation places per 1,000 residents (0.60 for low-density municipalities and 0.63 for high-density municipalities), as well as with the accommodation density index, measured by the number of beds per 100 km² (0.59 and 0.58, respectively).

Agglomeration municipalities seem to link their revenues less closely to the use of tourism potential. Although their own revenues correlate strongly with the number of entities operating in Section I (0.60), this is mainly due to strong links with catering activities, described in Subsection 56 of that section (0.55). In contrast, own revenues show a very weak relationship with accommodation activities, described in Subsection 55 (0.25). They also have no relationship with the tourist function of these municipalities, nor with the density of the tourist base.

The revenue of municipalities within landscape parks show weaker relationships with their tourism potential. Conversely to national park muni-

palities, the strongest relationships between the studied aspects are found in agglomeration municipalities. The own revenues of these municipalities are strongly correlated with the number of business entities engaged in Section I activities (0.54), especially with the number of individuals engaged in these activities (0.55). At the same time, municipalities' own revenues are more strongly correlated with the number of entities operating in Subsection 56 (0.54) than with the number of entities operating in Subsection 55 (0.41).

For non-agglomeration municipalities, there is a moderate correlation between their own revenues and the number of businesses operating in Section I (0.43 for low-density municipalities and 0.33 for high-density municipalities). In low-density municipalities, a moderate correlation is found for both entities operating in Subsection 55 (0.40) and in Subsection 56 (0.38). In high-density municipalities, on the other hand, own revenues are very weakly correlated with economic activity in Subsection 55 (0.20) and moderately with activity in Subsection 56 (0.34).

At the same time, in none of the groups of landscape park municipalities do their own revenues show a relationship with the tourist function of these municipalities, nor with the density of the tourist base.

The possibilities of using tourism potential to generate revenue for rural municipalities vary in different groups of municipalities, these groups being based on the share of protected areas in their total area. In the case of national park municipalities, only those with a protected area between 10% and 40% show a correlation between their own revenues and indicators characterizing their tourism potential. There is a strong correlation between the revenues of these municipalities and the number of business entities in Section I (0.60), including both those operating in Subsection 55 of this section (0.50) and in Subsection 56 (0.51). There is also a strong correlation of revenue with the tourist function a (0.57) and a moderate correlation with the density of the tourist base (0.43).

For landscape park municipalities, only in the group of municipalities where the area of parks is less than 10% of the total area, there was a strong correlation between own revenues and the number of entities operating in Section I (0.54), with a strong correlation between revenue and the number of entities registered in Subsection 56 (0.54), while a moderate correlation applies to the relationship with entities operating in Subsection 55 (0.34). Municipalities with a protected area between 10% and 40% have a moderate correlation between their own revenues and the indicators characterizing their tourism potential, and for municipalities where landscape parks cover the area the most (more than 40% of the area), the correlations are weak.

5. Discussion

The conclusions of the study on the evaluation of the level of revenues of rural municipalities within national parks and landscape parks, compared with other municipalities in Poland, indicate that in terms of total own revenues per capita, park municipalities do not differ from other rural municipalities in Poland, not covered by this type of protection. However, certain differences become apparent in terms of selected types of revenue, which constitute own revenues.

Within the group of non-agglomeration municipalities, national park municipalities receive the highest revenue derived from tax on economic activity of natural persons, paid in the form of tax card, and higher revenue from income taxes from natural persons, than non-park municipalities. On the other hand, municipalities associated with national parks receive the lowest revenue derived from agricultural tax. It can be thought that the existence of a national park is conducive to small business, such as the tourism industry. This revenue compensates for the lower revenue from limited agricultural activities, which is due to legal restrictions on land use within national parks. On the other hand, however, lower agricultural revenues does not necessarily have to be a consequence of protection-induced restrictions. Protected areas may have been designated in locations with lower agricultural potential, in areas where agricultural activities were already declining.

In the group of non-agglomeration municipalities, the landscape park municipalities are also characterized by higher revenue among the population than non-park municipalities, as evidenced by their raising the highest revenues from taxes on natural persons. On the other hand, they do not differ from municipalities outside of protected areas in terms of revenue from taxes on small businesses run by natural persons, and are even inferior to them in terms of revenue derived from agricultural and forestry taxes.

A specific group is formed by agglomeration rural municipalities. Their incomes are not differentiated by the existence or absence of protected areas. These units form a group of highly urbanized municipalities, which associate their development and generated revenue with a large city with which they have functional ties. Other ongoing studies lead to similar conclusions, which prove that the highest level of development among rural municipalities is demonstrated by urbanized municipalities. They are characterized by a higher population density, as well as a greater number of economic entities. These areas are more attractive for living and starting a business (Kudełko, 2019).

However, it should be noted that spillover effects to neighbouring municipalities are not addressed in the analysis. Municipalities adjacent to protect-

ed areas are treated as non-protected units, although they may benefit from positive externalities associated with tourism or environmental amenities.

Conclusions from studies aimed at assessing internal revenue variations within municipalities within national parks and landscape parks, confirm the regularities described above. The location factor is crucial in explaining variations among municipalities covered by legal protection. Both in the case of municipalities within national parks and landscape parks, agglomeration municipalities have significantly higher own revenues than non-agglomeration municipalities, including revenues from taxes on natural persons, legal persons and taxes on economic activity of natural persons. In contrast, low-density non-agglomeration municipalities have the highest revenues derived from agricultural tax and forestry tax.

At the same time, it was found that the share of protected area in the total area of municipalities generally does not affect the amount of revenue these entities earn. The percentage of protected area, however, is significant with regard to revenue derived from agricultural tax. Municipalities with the smallest percentage of protected area (up to 10% of the area) derive the highest revenue from agricultural tax, which is related to the limited opportunities for agricultural activity on the territories of municipalities with a higher percentage of protected areas. In the case of landscape parks, with regard to revenue derived from the forest tax, significantly higher revenue was earned by municipalities in which the protected area covers more than 40% of the total area. This is probably related to the greater afforestation of park areas.

A study of the relationship between the value of municipalities' own revenue and indicators related to tourism activities, shows that national park municipalities have more opportunities to use their tourism potential to generate their revenue, and in this way also stimulate development, than landscape park municipalities. This is especially true for non-agglomeration municipalities, where the share of park-covered area is between 10% and 40%. Such municipalities combine the benefits of proximity to a national park and the associated landscape and environmental attractions, while at the same time they can conduct economic activities on the greater part of their territory, unrestricted by legal prohibitions (in contrast to municipalities where the greater part of the territory is covered by protection and at the same time prohibitions on economic activity).

These conclusions are in line with the findings of other authors, who demonstrate that tourism activity and related revenues are one of the of the key benefits for entities operating in protected areas. Tourists' expenditures support the development of economic activity (Meehan, 2014; Sang et al., 2018; Yergeau, 2020), mainly in industries related to accommodation, food services and entertainment. This increases employment in protected areas, which in turn generates income growth for the local population (Bennett et al., 1996; Siltanen et al., 2023; Braber et al., 2018). The benefits associated

with tourism development offset the opportunity costs of reduced agricultural production or natural resource extraction (Sims, 2010).

In agglomeration municipalities the revenue is less related to the use of tourism potential. No relationship has been shown between the value of own revenues and the tourist function of these municipalities, as measured by the number of tourist accommodations per 1,000 residents, or the density of the tourist base, defined as the ratio of accommodations to the area of the municipality. Own revenues in agglomeration municipalities show a stronger correlation with their restaurant and catering businesses than with those associated with hotel and other lodging establishments. These results are likely influenced by the fact that agglomeration municipalities, as specific, highly urbanized units, clustered around larger cities and functionally connected to them, have access to other, non-tourist sources of revenue that non-agglomeration municipalities lack.

The revenues of municipalities within landscape parks show weaker links to their tourism potential than those of municipalities within national parks. This is probably related to their less attractive environmental and landscape qualities. Similarly, as in the case of units associated with national parks, own revenues show no relationship with the tourist function of these municipalities, nor with the density of the tourist base. Conversely to the case of national park municipalities, stronger relationships between the studied aspects are found in agglomeration municipalities than in non-agglomeration municipalities. The strongest relationship between own revenues and indicators describing tourism potential was identified in the group of municipalities where less than 10% of the area is covered by parks.

The obtained results should be approached with some caution. A correlation study does not indicate causality of some phenomena in relation to others, but only reveals their co-occurrence. In addition, significant limitations in the availability of official, verified statistical data available at the level of municipalities (e.g., on the number of tourists and the use of accommodations) prevent a more precise study of the importance of tourism activities for the revenues generated by the municipalities. In addition, the method of obtaining officially released data relating to the number of accommodation places is often based on estimates, which can limit the precision of the information provided. It's worth mentioning that when assessing the tourism function, only those facilities operated as part of a business are considered. Agritourism farms are not always run this way.

Moreover, protected areas are not randomly assigned in space, but they are established in locations with pre-existing touristic and environmental characteristics. Consequently, It is difficult to say for certain therefore whether protected areas foster tourism-related activities and revenues, or whether they are preferentially designated in already attractive territories.

6. Conclusion

The study made it possible to assess the level of own revenues of rural municipalities within national parks and landscape parks; to determine the revenue differentiation of different types of rural municipalities within protected areas, and to identify the relationship between earned own revenues and the tourism potential of municipalities.

The level of total own revenue of rural municipalities within national parks and landscape parks does not differ from other rural municipalities in Poland that do not have this type of protection. However, the structure of own revenue reveals the peculiarities of park municipalities. Residents of national park municipalities show a higher level of entrepreneurship, especially with regard to the business activities of individuals. Tax revenues generated by this activity compensate for lower revenues from limited agricultural activities.

The specificity of rural agglomeration municipalities, which are functionally linked to large cities, mean that their revenues are not differentiated by the existence or absence of protected areas. At the same time, agglomeration municipalities link their revenues to the use of tourism potential to a lesser degree.

Similarly, the share of protected areas in the total area of a municipality does not affect the amount of total revenue it earns. However, the larger the protected area, the more difficult it is to carry out agricultural activities, and on the other hand, there are greater opportunities to draw revenue from forest tax.

National park municipalities have more opportunities to use tourism potential to generate their revenues than landscape park municipalities. This is especially true for non-agglomeration municipalities.

The authors are aware of some shortcomings of the research conducted. These are mainly caused by a significant limitation in access to verified statistical data available at the level of municipalities. However, the topic seems timely and important, and the conclusions of the research open the way for further in-depth analysis. Future research directions could be supplemented by an analysis of the dynamics of changes in revenues of rural areas covered by park protection over a longer period of time. The next area of future research could be a broadened analysis, including other factors affecting the revenue structure and the development of park municipalities. Future research directions could also include other, non-financial aspects related to the development of protected areas, taking into account their specificity and uniqueness.

References

- Alló, M., Barrio, M., & Loureiro, M. (2010). Socioeconomic impacts of the National Parks: an approximation to the Atlantic Islands National Park. *Ecosistemas*, 19(2), 112–124.
- Anthony, B. (2007). The dual nature of parks: Attitudes of neighboring communities towards Kruger National Park, South Africa. *Environmental Conservation*, 34(3), 236–245. <https://doi.org/10.1017/S0376892907004018>
- Bennett, J., Gillespie, R., Powell, R., & Chalmers, L. (1996). The economic value and regional economic impact of national parks. *Australian Journal of Environmental Management*, 3(4), 229–239. <https://doi.org/10.1080/14486563.1996.10648360>
- Bennett, N. J., & Dearden, P. (2014). From measuring outcomes to providing inputs: Governance, management, and local development for more effective marine protected areas. *Marine Policy*, 50, 96–110. <https://doi.org/10.1016/j.marpol.2014.05.005>
- Bittlingmaier, S., Job, H., Mayer, M., von Ruschkowski, E., & Woltering M. (2021). Park–people relationships: The socioeconomic monitoring of national parks in Bavaria, Germany. *Sustainability*, 13(16), 8984, <https://doi.org/10.3390/su13168984>
- Braber, B., Evans, K. L., & Oldekop, J. A. (2018). Impact of Protected Areas on Poverty, Extreme Poverty, and Inequality in Nepal, *Conservation Letters*, 11(6). <https://doi.org/10.1111/conl.12576>
- Buono, F., Padiaditi, K., & Carsjens, G.J. (2012). Local Community Participation in Italian National Parks Management: Theory versus Practice. *Journal of Environmental Policy & Planning*, 14(2), 189–208, <https://doi.org/10.1080/1523908X.2012.683937>
- Byström, J., & Müller, D. K. (2014). Tourism Labor Market Impacts of National Parks. The Case of Swedish Lapland. *Zeitschrift für Wirtschaftsgeographie*, 58 (1–2). 115–126. <https://doi.org/10.1515/zfw.2014.0008>
- D'Alberto, R., Pagliacci, F., & Zavalloni, M. (2023). A socioeconomic impact assessment of three Italian national parks. *Journal of Regional Science*, 63, 114–147. <https://doi.org/10.1111/jors.12618>
- Etxano, I. (2010). Socioeconomic Impacts of National Parks: A Case Study from the North-East of England, *Lurralde: Investigacion y Espacio*, 33, 159–176.
- Fan, L., Feng, C., Huang, W., Tian, J., Wang, W., & Wang, Z. (2022). Balancing the Conservation and Poverty Eradication: Differences in the Spatial Distribution Characteristics of Protected Areas between Poor and Non-Poor Counties in China. *Sustainability*, 14, 4984. <https://doi.org/10.3390/su14094984>
- Fredman, P., & Yuan M. (2011). Primary Economic Impacts at Three Spatial Levels: The Case of Fulufjället National Park, Sweden, *Scandinavian*

- Journal of Hospitality and Tourism*, 11, 74–86. <https://doi.org/10.1080/15022250.2011.629910>
- Getzner, M. (2010). Impacts of protected areas on regional sustainable development: the case of the Hohe Tauern national park (Austria), *International Journal of Sustainable Economy*, 2(4), 419–441. <https://doi.org/10.1504/IJSE.2010.035488>
- Jaros, H. (2015). The Public and Economic Aspects of the Functioning of Protected Areas within a Commune, *Miscellanea Geographica*, 19(1), 24–28. <https://doi.org/10.2478/mgrsd-2014-0032>
- Kandel, P., Pandit, R., Polyakov, M., White, B. (2022). Do protected areas increase household income? Evidence from a Meta-Analysis, *World Development*, 159, 106024. <https://doi.org/10.1016/j.worlddev.2022.106024>.
- Kőszegi, M., Gessert, A., Nestorová-Dická, J., Gruber, P., & Bottlik, Z. (2022). Social assessment of national parks through the example of the Aggtelek National Park. *Hungarian Geographical Bulletin*, 71(2), 149–162. <https://doi.org/10.15201/hungeobull.71.2.4>
- Kudełko, J. (2019). Trends in the Development of Rural Municipalities in the Małopolska Voivodship. *Annals of the Polish Association of Agricultural and Agribusiness Economists*, 21(3), 1508–3535. <https://doi.org/10.5604/01.3001.0013.3543>
- Law on nature protection of April 16 2004, (2004). *Journal of Laws* 2024. pos. 1478.
- Local Data Bank, www.stat.gov.pl
- Meehan, J. (2014). *Economic Contributions of National Park Visitations: Analyses of Spending Effects*. Nova Science Publishers Inc.
- Meyer, M., Müller, M., Woltering, M., Arnegger, J., & Joba, H. (2010). The Economic Impact of Tourism in Six German National Parks. *Landscape and Urban Planning*, 97(2), 73–82. <https://doi.org/10.1016/j.landurbplan.2010.04.013>
- Mika, M., Zawilińska, B., & Kubal-Czerwińska, M. (2019). Exploring the determinants of local people's attitude toward national parks in Poland. *Folia Geographica*, 61(1), 5–16.
- Mojo, D., Oduor, A.M.O., Fu, C., Bai, Y., Long, H., Wang, G. & Zhang, L. (2020). Effects of Protected Areas on Welfare of Local Households: The Case of Maasai Mara National Reserve in Kenya. *People and Nature*, 2(3), 856–867. <https://doi.org/10.1002/pan3.10123>
- Moore, F., Lamond, J. & Appleby, T. (2016). Assessing the Significance of the Economic Impact of Marine Conservation Zones in the Irish Sea upon the Fisheries Sector and Regional Economy in Northern Ireland. *Marine Policy*, 74, 856–867. <https://doi.org/10.1016/j.marpol.2016.09.025>
- Rauf, T., Yukan, C., Zada, M., Khan, N., & Shah, S.J. (2020). Impact of Saiful Malook national park on the sustainable livelihood of Naran and Kaghan communities, Pakistan. *GeoJpurnal*, 85, 1227–1239. <https://doi.org/10.1007/s10708-019-10019-z>

- Robertson, T., Greenhalgh, S., Korovulavula, I., Tikoibua, T., Radikedike, P., & Stahlmann-Brown, P. (2020). Locally managed marine areas: Implications for socio-economic impacts in Kadavu, Fiji, *Marine Policy*, 117, 103950. <https://doi.org/10.1016/j.marpol.2020.103950>
- Rodríguez-Rodríguez D., & López I. (2020). Socioeconomic effects of protected areas in Spain across spatial scales and protection levels. *Ambio*, 49(1), 258–270. <https://doi.org/10.1007/s13280-019-01160-7>
- Saayman, M., & Saayman, A. (2006). Creating a Framework to Determine the Socio-Economic Impact of National Parks in South Africa: A Case Study of the Addo Elephant National Park, *Tourism Economics*, 12(4), 619–633. <https://doi.org/10.5367/000000006779319990>
- Sang, L. T., Mansur, K. M., Jidwin, A. P., Majid, A. A., Boroh, R. P., Mohidin, R., Nuddin, J. A., & Pusiran, K. (2018). Socioeconomic impact of Tun Sakaran Marine Park: A descriptive study of the perceptions of the local. *ASM Science Journal*, 11(3), 224–232. <https://eprints.ums.edu.my/id/eprint/24357>
- Siltanen, J., Petursson, J.G., Cook, D., & Davidsdottir, B. (2023). Evaluating economic impacts of protected areas in contexts with limited data; the case of three national parks in Iceland, *Journal of Environmental Management*, 342, 118085. <https://doi.org/10.1016/j.jenvman.2023.118085>
- Sims, K. R. E. (2010). Conservation and development: Evidence from Thai protected areas. *Journal of Environmental Economics and Management*, 60(2), 94–114. <https://doi.org/10.1016/j.jeem.2010.05.003>
- Stynes, D.J. (2011). Economic benefits to local communities from national park visitation and payroll, Natural Resource Report NPS/NRSS/EQD/NRR–2011/481. Nova Science Publishers, Inc.
- Thomas, C. C., Huber, C., & Koontz, L. (2014). 2012 National Park Visitor Spending Effects: Economic Contributions to Local Communities, States, and the Nation, Natural Resource Report NPS/NRSS/EQD/NRR–2014/765, 1–42. Nova Science Publishers, Inc.
- Vedeld, P., Jumane, A., Wapalila, G., & Songorwa, A. (2012). Protected areas, poverty and conflicts: A livelihood case study of Mikumi National Park, Tanzania. *Forest Policy Economics*, 21, 20–31. <https://doi.org/10.1016/j.FORPOL.2012.01.008>
- White, A. T., Courtney, C. A., & Salamanca, A. (2002). Experience with marine protected area planning and management in the Philippines. *Coastal Management*, 30(1), 1–26. <https://doi.org/10.1080/08920750252692599>
- Withey, P., Lantz, V. A., Ochuodho, T., Patriquin, M. N., Wilson, J. & Kennedy M. (2018) Economic impacts of conservation area strategies in Alberta, Canada: A CGE model analysis. *Journal of Forest Economics*, 33, 33–40. <https://doi.org/10.1016/j.jfe.2018.10.004>
- Yergeau, M. E. (2020). Tourism and local welfare: A multilevel analysis in

- Nepal's protected areas, *World Development*, 127, 104744. <https://doi.org/10.1016/j.worlddev.2019.104744>
- Young, O. R, King, L. A., & Schroeder, H. (2008). *Institutions and environmental change: principal findings, applications, and research* Frontiers. Cambridge, MA: MITPress. <https://doi.org/10.7551/mitpress/9780262240574.001.0001>
- Zawilińska, B., & Mika, M. (2015). Economic Function of National Parks in the Local Economy. Theoretical Assumptions and Research Model (Ekonomiczna funkcja parków narodowych w gospodarce lokalnej. Założenia teoretyczne i koncepcja badań), *Studia KPZK PAN*, 161, 385–392.

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Appendix

Data availability: The dataset supporting the findings of this study is available in the ROD-BUK repository at <https://doi.org/10.58116/UEK/PF4LS7>

Table 1. Objects of special natural values legally protected in Poland (as of 2023)

Specification	Number	Total area in ha	% of country's area
National parks	23	315 237.40	1.0
Nature reserves	1523	172 987.74	0.6
Landscape parks	126	2 615 717.43	8.3
Protected landscape areas	389	7 014 193.90	22.3
Natura 2000 areas	1013	8507779.4	27.1
Documentation site	186	928.97	0.0
Ecological area	8217	56 739.55	0.2
Natural and landscape complexes	319	117 291.25	0.4

Source: Local Data Bank, Statistics Poland, www.stat.gov.pl

Table 2. Average values of selected types of revenue of rural municipalities covered by national parks and landscape parks, and of other rural municipalities in Poland in 2023.

Specification	agglomeration municipalities			high-density non-agglomeration municipalities			low-density non-agglomeration municipalities		
	municipalities within national parks	municipalities within landscape parks	municipalities outside of national parks or landscape parks	municipalities within national parks	municipalities within landscape parks	municipalities outside of national parks or landscape parks	municipalities within national parks	municipalities within landscape parks	municipalities outside of national parks or landscape parks
Number of municipalities	18	76	185	23	175	531	34	123	335
Total own revenue per capita in PLN	3465.14	2855.66	3040.75	2274.04	2570.65	2700.58	3077.38	2612.74	2516.08
Revenue from shares in income taxes from natural persons constituting income of the state budget per capita in PLN	1206.04	925.47	905.54	531.84	678.43	650.92	514.66	533.94	517.72
Revenue from shares in income taxes from legal persons constituting income of the state budget per capita in PLN	129.61	51.49	61.90	19.15	39.09	43.59	23.42	29.17	22.85
Revenue from tax on economic activity of natural persons, paid in the form of tax card per capita in PLN	3.78	2.54	2.74	6.34	2.15	2.15	4.76	2.27	1.35
Revenue from agricultural tax per capita in PLN	66.20	84.90	104.14	35.44	98.66	130.04	132.93	162.69	229.57
Revenue from forestry tax per capita in PLN	15.32	24.53	18.48	25.63	25.85	16.58	184.37	90.75	64.57

Shaded boxes indicate the presence of statistically significant differences between the highlighted municipalities
Source: own calculations based on statistics made available in the Bank of Local Data, Statistics Poland.

Table 3. Average values of selected types of revenue of rural municipalities of different locations within national parks and landscape parks in 2023.

Specification	municipalities within national parks			municipalities within landscape parks		
	agglomeration municipalities	high-density non-agglomeration municipalities	low-density non-agglomeration municipalities	agglomeration municipalities	high-density non-agglomeration municipalities	low-density non-agglomeration municipalities
Number of municipalities	18	23	34	76	175	123
Total own revenue per capita in PLN	3465.14	2274.04	3077.38	2855.66	2570.65	2612.74
Revenue from shares in income taxes from natural persons constituting income of the state budget per capita in PLN	1206.04	531.84	514.66	925.47	678.43	533.94
Revenue from shares in income taxes from legal persons constituting income of the state budget per capita in PLN	129.61	19.15	23.42	51.49	39.09	29.17
Revenue from tax on economic activity of natural persons, paid in the form of tax card per capita in PLN	3.78	6.34	4.76	2.54	2.15	2.27
Revenue from agricultural tax per capita in PLN	66.20	35.44	132.93	84.90	98.66	162.69
Revenue from forestry tax per capita in PLN	15.32	25.63	184.37	24.53	25.85	90.75

Shaded boxes indicate the presence of statistically significant differences between the highlighted municipalities

Source: own calculations based on statistics made available in the Bank of Local Data, Statistics Poland.

Table 4. Average values of selected types of revenue of rural municipalities with different areas covered by national parks and scenic parks in 2023

Region	municipalities within national parks			municipalities within landscape parks		
	agglomeration municipalities	high-density non-agglomeration municipalities	low-density non-agglomeration municipalities	agglomeration municipalities	high-density non-agglomeration municipalities	low-density non-agglomeration municipalities
Dolnośląskie	0	1	1	2	23	3
Kujawsko-pomorskie	0	0	0	4	11	15
Lubelskie	0	2	6	8	19	22
Lubuskie	0	0	2	1	1	10
Łódzkie	0	1	0	3	15	8
Małopolskie	3	15	1	8	13	0
Mazowieckie	6	0	1	11	7	13
Opolskie	0	0	0	6	2	2
Podkarpackie	0	3	4	2	15	8
Podlaskie	3	0	14	2	2	6
Pomorskie	0	1	4	2	12	10
Śląskie	0	0	0	16	28	2
Świętokrzyskie	4	0	0	7	9	4
Warmińsko-mazurskie	0	0	0	0	3	12
Wielkopolskie	2	0	0	2	15	5
Zachodniopomorskie	0	0	1	2	0	3
Total	18	23	34	76	175	123

Source: own calculations based on statistics made available in the Bank of Local Data, CSO.

Table 5. Average values of selected types of revenue of rural municipalities with different areas covered by national parks and scenic parks in 2023

Specification	municipalities covered by national parks			municipalities covered by landscape parks		
	share of municipal area covered by park < 10%	share of the municipality's area covered by the park [10%, 40%)	Share of municipal area covered by park > 40%	share of municipal area covered by park < 10%	share of the municipality's area covered by the park [10%, 40%)	Share of municipal area covered by park > 40%
Number of municipalities	35	28	12	99	160	115
Total own revenue per capita in PLN	2560.0	3202.2	3337.2	2641.4	2624.7	2667.9
Revenue from shares in income taxes from natural persons constituting income of the state budget per capita in PLN	609.9	674.0	935.2	687.8	676.3	682.0
Revenue from shares in income taxes from legal persons constituting income of the state budget per capita in PLN	23.5	43.1	128.4	41.1	37.1	37.7
Revenue from tax on economic activity of natural persons, paid in the form of tax card per capita in PLN	2.7	6.0	9.4	2.1	2.6	2.0
Revenue from agricultural tax per capita in PLN	118.2	65.7	45.7	142.1	116.1	96.4
Revenue from forestry tax per capita in PLN	60.3	117.3	145.0	39.3	41.5	61.1

Shaded boxes indicate the presence of statistically significant differences between the highlighted municipalities

Source: own calculations based on statistics made available in the Bank of Local Data, CSO.

Table 6. Correlation between own revenue per capita of rural municipalities with different locations and selected characteristics in 2023

Selected features	The value of Spearman's correlation coefficient between own revenue per capita and selected characteristics						
	municipalities within national parks			municipalities within landscape parks			
	agglomeration municipalities	high-density non-agglomeration municipalities	low-density agglomeration municipalities	agglomeration municipalities	high-density non-agglomeration municipalities	low-density agglomeration municipalities	
National economy entities registered in the REGON register in Section I per 10 thousand residents.	0.60	0.58	0.64	0.54	0.33	0.43	
Natural persons doing business in Section I per 10,000 residents.	0.51	0.58	0.54	0.55	0.27	0.39	
Legal persons and non-corporate organizational entities in Section I per 10 thousand residents.	0.53	0.60	0.55	0.49	0.38	0.37	
Entities of national economy registered in the REGON register in Section I in Subsection 55 per 10 thousand residents.	0.25	0.50	0.58	0.41	0.20	0.40	
Entities of national economy registered in the REGON register in Section I in Subsection 56 per 10 thousand residents.	0.55	0.62	0.62	0.54	0.34	0.38	
Tourist function of the municipality - number of tourist accommodation places per 1,000 residents.	0.01	0.63	0.60	0.15	0.11	0.28	
Accommodation density index - number of beds per 100 km ²	0.07	0.58	0.59	0.20	0.10	0.27	

Shaded boxes indicate the presence of a correlation significant at the 0.01 level

Source: own calculations based on statistics made available in the Bank of Local Data, CSO.

Table 7. Correlation between own revenue per capita of rural municipalities with different protected areas and selected characteristics in 2023

Selected features	The value of Spearman's correlation coefficient between own revenue per capita and selected characteristics					
	municipalities within national parks			municipalities within landscape parks		
	share of municipal area covered by park < 10%	share of the municipality's area covered by the park [10% , 40%)	Share of municipal area covered by park > 40%	share of municipal area covered by park < 10%	share of the municipality's area covered by the park [10% , 40%)	Share of municipal area covered by park > 40%
National economy entities registered in the REGON register in Section I per 10 thousand residents.	0.28	0.60	0.10	0.54	0.44	0.28
Natural persons doing business in Section I per 10,000 residents.	0.28	0.46	0.10	0.49	0.39	0.23
Legal entities and non-corporate organizational entities in Section I per 10 thousand residents.	0.31	0.50	0.28	0.46	0.37	0.44
Entities of national economy registered in the REGON register in Section I, Subsection 55 per 10 thousand residents.	0.14	0.50	-0.06	0.34	0.28	0.31
Entities of national economy registered in the REGON register in Section I, Subsection 56 per 10 thousand residents.	0.34	0.51	0.46	0.54	0.42	0.29
Tourist function of the municipality - number of tourist accommodations per 1,000 residents.	0.29	0.57	-0.24	0.10	0.15	0.20
Accommodation density index - number of beds per 100 km ²	0.28	0.43	-0.08	0.11	0.17	0.21

Shaded boxes indicate the presence of a correlation significant at the 0.01 level

Source: own calculations based on statistics made available in the Bank of Local Data, CSO.



Natural Resource Funds and Their Stabilization Function: Methodological- -Empirical Foundations

YANINA DYMITROWSKA

Department of Macroeconomics and Development Studies, Institute of Economics,

Poznan University of Economics and Business,

al. Niepodległości 10, 61-875 Poznań

✉ yanina.dymitrowska@ue.poznan.pl

 ORCID: 0000-0002-2772-5971

Abstract

Motivation: Research on the stabilization function of natural resource funds (NRF) is extensive but fragmented, with diverse samples, indicators, and methods limiting comparability.

A systematic synthesis and transparent research framework are needed to enable robust empirical testing.

Aim: This study aims to build a comprehensive methodological-empirical foundation for analyzing the stabilization function of NRF in counteracting the resource curse (RC). It does so by systematically reviewing existing empirical research, assessing prior methodologies and indicators, and constructing a transparent research sample of resource-rich economies and their resource funds.

Results: The study employs the Systematic Literature Review (SLR) to synthesize quantitative and qualitative research on the stabilization function of NRF, with attention to research samples, methods, and macroeconomic indicators. Based on the literature on the RC, 49 resource-rich economies were identified and classified by resource type and level of development. Within this group, 43 NRF were examined in terms of type, investment strategies, and compliance with the Santiago Principles, covering the period 2000–2023. The findings pro-

vide a transparent and replicable research sample and consolidate dispersed methodological evidence, offering a robust empirical foundation for subsequent econometric analysis.

Keywords: natural resource funds, stabilization, resource curse, economic development, resource rich countries

JEL: F21, O11, O23, Q32, Q38

1. Introduction

In the 1970s, many governments in resource-rich countries introduced a policy instrument designed to counteract the RC – the paradox of slower economic development in resource-abundant economies compared to those with limited natural endowments (Dymitrowska, 2023). This instrument took the form of natural resource funds (NRF)¹, established primarily to stabilize domestic economies heavily dependent on resource exports and to shield them from fluctuations in global commodity markets.

Over time, the role of these funds evolved significantly. Today, they are created not only to fulfill stabilization objectives but also to serve investment, savings, and diversification purposes. The design, management, and objectives of NRF have become increasingly sophisticated, with a growing number of such funds established in developing and emerging economies. Given the persistent volatility of commodity prices, it remains essential to examine whether NRF – considering their varying types and structures – continue to perform their stabilization function effectively.

Scholarly opinions on this issue remain divided (e.g., Bagattini, 2011; Ouoba, 2020; Sugawara, 2014; Taguchi & Ganbayar, 2022). Existing research is often fragmented, relying on diverse samples, indicators, and methodologies that hinder comparability. Moreover, empirical evidence remains limited. Due to the multidimensional and complex nature of the phenomenon, there is a clear need for systematic synthesis and a transparent analytical framework that can support robust empirical testing.

This study aims to build a comprehensive methodological and empirical foundation for analyzing the stabilization function of NRF in counteracting the resource curse (RC).

The research employs the Systematic Literature Review (SLR) method to critically examine both quantitative and qualitative studies addressing NRF stabilization role, with a particular focus on research design, sample selection, and macroeconomic indicators. In a subsequent step, drawing on

¹ For consistency, the term Natural Resource Fund (NRF) is used throughout the paper to refer collectively to all such funds.

the RC literature, a group of 49 resource-rich economies was identified and classified according to resource specialization and level of economic development. For each country, the existence, type, and investment strategy of NRF were verified, along with their adherence to the Santiago Principles - thereby creating a transparent and replicable framework for future econometric analysis.

The paper is organized into three main sections, framed by an introduction and a concluding discussion. The first section provides a conceptual and theoretical background to the topic and highlights the study's contribution to the existing body of knowledge. The second section presents the research design and methodology. The third section summarizes the main findings and offers a discussion of their implications.

2. Literature review

The resource curse (RC) refers to the paradox in which countries abundant in natural resources often experience slower economic development and weaker poverty reduction than nations with more diversified economic structures (Dymitrowska, 2023). This issue continues to be highly relevant, particularly amid contemporary global challenges such as the economic repercussions of the COVID-19 pandemic, rising inflation, ongoing armed conflicts, and the sustained volatility of key commodity prices.

Over recent decades, global commodity markets have shown persistent instability, constituting a key macroeconomic mechanism underpinning the RC. In response to fiscal fluctuations driven by commodity price volatility, many governments began establishing NRF in the 1970s to buffer domestic economies and stabilize revenues. Over the years, the role and structure of NRF have evolved significantly. A key turning point was the success of the Norwegian NRF, which broadened the original objective of economic stabilization to include the accumulation of financial capital for future generations. This shift contributed to the growing popularity of new types of NRF. Initially, investment funds gained traction – these aimed to accumulate revenues from resource extraction and allocate them to domestic and foreign investment projects. More recently, however, savings funds, also known as future generations funds, have become increasingly prominent. Their purpose is to invest resource revenues in long-term assets, primarily abroad, with the goal of preserving wealth for future generations.

Although the oldest fund of this type – the Texas Permanent University Fund - was established in 1876, over 52% of all savings funds have been created since 2005, and more than 70% of them were launched after 2010 (Dymitrowska, 2023). Notably, an increasing number of emerging and developing economies are now opting to establish this type of fund.

The establishment of NRF has primarily aimed - and continues to aim - at mitigating the effects of the RC. In recent years, growing attention from scholars, international organizations, and governments of resource-rich countries has focused on evaluating how effectively these funds address the challenges associated with the phenomenon (Ouoba, 2020; Sugawara, 2014; Taguchi & Ganbayar, 2022; Tsani, 2015). This surge of interest stems largely from the rising prominence of NRF within the global financial system. Today, they represent more than half of all Sovereign Wealth Funds (SWFs), whose combined assets total approximately USD 15.2 trillion. (SWFI, n.d.).

The question of whether NRF effectively counter the RC is complex and inherently multidimensional, intersecting macroeconomic, social, political, institutional, cultural, and historical domains. The literature encompasses both broad cross-country comparisons (e.g., Bagattini, 2011; Ouoba, 2020; Sugawara, 2014; Taguchi & Ganbayar, 2022) and detailed case studies (e.g., Baena et al., 2012; Chalk et al., 1997; Dymitrowska, 2023; Fasano-Filho, 2000; Lücke, 2011), applying qualitative (e.g., Fasano-Filho, 2000; Kalyuzhnova, 2006; Le Borgne & Medas, 2021; Usui, 2007) and quantitative (e.g., Bagattini, 2011; Ossowski et al., 2008; Ouoba, 2020; Shabsigh & Ilahi, 2007; Sugawara, 2014; Tsani, 2013, 2015) approaches. These works explore multiple aspects of fund design and performance, including fund typology (Taguchi & Ganbayar, 2022), governance mechanisms (Tsani, 2013, 2015), and primary operational objectives (Taguchi & Ganbayar, 2022).

The literature offers no unified conclusion regarding the effectiveness of NRF. Some studies confirm their success in achieving specific goals (Bagattini, 2011; Sugawara, 2014; Taguchi & Ganbayar, 2022), others emphasize that effectiveness depends on certain institutional or policy conditions (Allegret et al., 2018; Le Borgne & Medas, 2021; Usui, 2007), while some argue that they remain largely ineffective (Davis et al., 2001; Ouoba, 2016). Others express ambivalence or inconclusive findings (Barnett & Ossowski, 2021; Ossowski et al., 2008; Ouoba, 2016).

Given the importance of this issue for the economic development of resource-rich countries and the stability of the global economy, advancing detailed and methodologically sound research remains a critical priority. This paper presents an initial step in evaluating the effectiveness of NRF in mitigating the RC. It forms the first phase of a broader research project undertaken by the author, with the overall research framework illustrated in Figure 1.

Key macroeconomic drivers of the RC include commodity price volatility, the Dutch disease, and excessive dependence on resource extraction and exports. Within this context, NRF are expected to perform four core functions – stabilization, investment, savings, and diversification – each mitigating the adverse effects of the curse (Figure 1). The stabilization function primarily targets commodity price volatility by smoothing fiscal revenues and

expenditures over the commodity price cycle. Savings and investment functions address intertemporal and structural dimensions of the RC by reducing procyclicality and supporting long-term growth, while diversification aims to alleviate excessive dependence on the resource sector and related Dutch disease pressures through broader asset allocation.

This study focuses on the stabilization function of NRF in alleviating the RC, with attention to differences across fund types, forming the methodological basis for further empirical analysis.

Stabilization funds aim to smooth economic fluctuations by saving surplus revenues from resource exports when prices exceed a predefined threshold, typically determined by national macroeconomic conditions. Their assets, usually short-term and liquid, are drawn upon when prices fall to offset fiscal shortfalls. Investment funds allocate a portion of resource revenues to short- and long-term assets, domestically and abroad. Although not explicitly designed for stabilization, returns from these investments - especially foreign ones - can indirectly reduce fiscal vulnerability. Savings funds pursue long-term wealth preservation by investing resource revenues in long-term, often foreign, financial assets. They generate alternative income streams, support diversification, and accumulate capital for a post-resource economy. Over time, such funds may enable a transition from resource to capital exporting. While not directly stabilizing, their consistent returns contribute indirectly to economic stability. Given the rising prominence of investment and savings funds, particularly in emerging and developing economies, it is pertinent to examine whether these fund types also exhibit a stabilizing function.

Despite the growing body of literature on NRE, existing empirical evidence on their stabilization effects remains fragmented and inconclusive. Studies differ substantially in terms of research design, volatility measures, institutional controls, country coverage, and time horizons, which limits the comparability of results and contributes to mixed findings. Moreover, much of the literature relies on heterogeneous definitions of resource-rich countries and fund types, often without a systematic or up-to-date classification framework. These limitations highlight the need for a more transparent and structured synthesis of existing evidence, which the present study seeks to address.

3. Methods

The research was conducted in three stages. First, a comprehensive critical literature review was carried out using the SLR method to examine existing empirical studies, clarify key concepts, identify dependent, independent, and control variables, and determine the time frames adopted in prior research. Second, resource-rich countries were identified through descriptive and comparative statistical analysis combined with a rule-based classification

approach. Threshold criteria derived from the World Bank's World Development Indicators (WDI) determined country eligibility, after which countries were classified by dominant resource type (fuel or mineral) and level of economic development. Third, a structural and institutional analysis examined individual NRF, assessing their establishment timelines, evolution, and classification by fund type and investment strategy.

3.1. Systematic Literature Review

A comprehensive critical literature review was undertaken, employing the SLR method, which has gained prominence in recent years. The review covers the period from 1990 to 2025. This starting point reflects that most NRF were created in the 1980s, and reliable empirical evidence on their effectiveness could emerge only after a decade of operation. This assumption is consistent with Ouoba (2020), who argues that funds require around ten years to accumulate sufficient capital to generate observable effects. The review period ends in 2025, with data collected on March 27, 2025.

Two databases were consulted - Scopus and Google Scholar – both recognized as authoritative sources of scientific information. The first stage identified publications concerning NRF operations through Scopus searches using the keywords “resource fund”, “oil fund”, “petroleum fund”, and “natural resource fund”, restricted to the defined period and filtered by “article title, abstract, keywords” within the disciplines of social sciences, economics, econometrics and finance, and energy. Given the heterogeneity of terminology in the literature, the review was complemented by backward and forward citation tracking and thematic screening of related studies on fiscal stabilization and resource revenue management. Google Scholar searches were conducted during a defined time window using relevance-based sorting, acknowledging the inherent limitations of replicability associated with this database. This produced 211 records.

At the second stage, abstracts were screened, excluding studies that did not examine NRF effectiveness in mitigating the RC, resulting in 20 publications. A complementary search in Google Scholar was then conducted, acknowledging its broader coverage. Cross-referencing both databases yielded a consolidated list of 33 articles.

Finally, the abstracts and findings of these studies were analyzed to identify those specifically assessing the stabilization role of NRF in addressing the RC. A total of 21 studies were selected and categorized based on the following criteria:

- type of study: quantitative or qualitative,
- effectiveness assessment: effective, effective under certain conditions, ineffective, lack of effect.

At this stage, studies were excluded if they were descriptive, conceptual, or did not directly assess macroeconomic or fiscal stabilization outcomes. The results of this stage are presented in Table 1.

In the final SLR phase, eight empirical studies were analyzed in depth, of which five were identified as most representative of the research topic. The term “most representative” refers to empirical studies that explicitly estimate the stabilization effects of NRF using quantitative methods, comparable outcome variables, and clearly defined country-fund samples. Each was examined in terms of methodology - including indicators of fund effectiveness in fulfilling the stabilization function, specified dependent variables and their volatility transformations, as well as primary and control independent variables – together with data sources, research periods, findings, and recommendations. The outcomes of this analysis are summarized in Table 2.

While a formal PRISMA flow diagram is not reported due to space constraints, the sequential screening process and inclusion criteria are explicitly described in the text.

3.2. Identification and classification of resource-rich countries and NRF

The research sample comprises resource-rich countries affected by the RC, defined as economies specializing in the extraction and export of natural resources or those predominantly resource-based. Following a review of inclusion criteria in the literature, countries were classified as resource-rich if they met one of two thresholds: average annual extractive revenues exceeding 25% of GDP or natural resources constituting at least 25% of average annual exports. These benchmarks follow prior RC studies (Auty, 2004; Dymitrowska, 2020, 2023; Gelb, 1988; Stevens, 2003; van der Ploeg, 2011).

The analysis focuses on strategic resources typically linked to the RC – fuels (oil, gas, coal) and minerals (tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, phosphate). Data from the WDI (accessed 19 December 2024) cover 2000–2023, with 2000 chosen as the baseline year marking the global expansion of NRF, particularly savings funds. The 24-year period provides a robust basis for empirical assessment, with 2023 determined by data availability.

Resource-rich countries were identified using six indicators: mineral, oil, gas, and coal rents (% of GDP), and fuel as well as ores and metals exports (% of merchandise exports). Two composite indices – Total Natural Resources Rents (TNRR) and Total Natural Resources Exports (TNRE) – were then computed. Countries exceeding the threshold in at least 13 of the 24 years were included in the sample.

Subsequently, NRF operating within these countries were examined using data from the International Forum of Sovereign Wealth Funds (IFSWF), the

Sovereign Wealth Fund Institute (SWFI), and official fund or government sources.

The applied methodological approach is directly aligned with the study's objective of building a comprehensive methodological-empirical foundation for analyzing the stabilization function of NRF in counteracting the RC. By combining a SLR with the identification and classification of resource-rich economies and their NRF, the method enables a structured and transparent synthesis of existing empirical evidence. At the same time, the approach is subject to limitations inherent to secondary data analysis, including reliance on the scope, quality, and methodological diversity of available empirical studies.

4. Results

4.1. Key insights from the SLR

All studies identified in the final SLR stage (Table 2) applied econometric panel-data analysis but varied considerably in sample size. The most extensive was Sugawara's (2014) study, covering 68 resource-rich countries and 32 NRF. The second-largest and most recent, by Taguchi and Ganbayar (2022), analyzed 41 countries and 54 NRF, reflecting the marked growth in newly established funds in recent years.

Taguchi underscores the importance of classifying NRF by their intended function when assessing their effectiveness, highlighting the increasing significance of emerging fund types within the broader development policy framework of resource-rich countries.

Several studies focus exclusively on oil-exporting countries (Ossowski et al., 2008; Shabsigh & Ilahi, 2007), reflecting a broader trend in research on NRF effectiveness (e.g., Allegret et al., 2018). Given that fuel commodities constitute strategic resources, specialized analyses of this group are fully warranted.

However, the RC affects both fuel- and mineral-exporting countries. Incorporating both resource categories thus enhances the analytical depth of the study and enables a meaningful comparison between fuel- and mineral-rich economies.

All authors assumed that NRF function as counter-cyclical buffers mitigating commodity price shocks. Their analyses consistently tested whether NRF reduce macroeconomic volatility, employing either monetary (Shabsigh & Ilahi, 2007) or fiscal performance indicators (Bagattini, 2011; Ossowski et al., 2008; Sugawara, 2014; Taguchi & Ganbayar, 2022). This approach aligns with the macroeconomic perspective of RC theory.

Regarding the dependent variable, most studies assess the impact of NRF on government expenditure stability. Some extend the analysis by including

additional measures; for instance, Ossowski et al. (2008) and Taguchi and Ganbayar (2022) also examine the primary balance alongside expenditure stability.

Bagattini (2011) proposed a composite indicator – the Stabilization Fund Success Variable - based on an additive six-point scale. One point is assigned at the end of each fiscal year for meeting the following conditions:

1. a non-negative overall fiscal balance;
2. an improvement in the overall fiscal balance;
3. a non-negative non-resource fiscal balance;
4. an improvement in the non-resource fiscal balance;
5. an increase in non-resource revenues;
6. a reduction in public debt.

In contrast, the study by Shabsigh & Ilahi (2007) used a different approach to the dependent variable, focusing on indicators of monetary stability, specifically: volatility of money supply, the consumer price index (CPI), and real effective exchange rates (REER).

Although government expenditure is the most frequently used dependent variable, approaches to measuring its volatility differ. Sugawara (2014) analyses the volatility of discretionary expenditure (Table 2), while Taguchi and Ganbayar (2022) use the absolute deviation of total government expenditure from its period average, expressed as a percentage of GDP.

Sugawara (2014) also considers alternative dependent variables, including the volatility of total, investment, and consumption expenditure, as well as of the cyclically adjusted fiscal balance. He further proposes an alternative volatility measure – the five-year moving standard deviation of annual growth rates. The remaining authors did not measure volatility directly, relying instead on broader fiscal or monetary indicators to assess fund effectiveness.

Both Sugawara (2014) and Taguchi and Ganbayar (2022) contend that NRF must operate for at least five years to produce meaningful outcomes, a lag explicitly incorporated into their analyses. Other studies omit such temporal adjustments. In the broader literature on the effectiveness of NRF, a noteworthy contribution is the study by Ouoba (2016), who emphasizes that a fund should exist for at least ten years before reliable results can be expected.

When analyzing the types of funds examined, Sugawara (2014) and Taguchi and Ganbayar (2022) focus specifically on the effectiveness of stabilization funds in enhancing macroeconomic stability, whereas other authors analyze NRF more broadly without differentiating fund types. Bagattini (2011) introduces two control variables – stabilization and savings – to distinguish funds by purpose, though the study does not emphasize differences between these categories.

Across all reviewed studies, the primary independent variable is the existence of an NRF in a given country. A broad set of control variables is also

employed, including population, economic growth, inflation, resource dependence, trade and capital openness, financial development, export diversification, geography, resource prices, and export shares. All authors further emphasize institutional controls, underscoring the central role of institutional quality in evaluating NRF effectiveness.

When analyzing the main findings – namely, whether NRF fulfill their stabilization function – Bagattini (2011), Sugawara (2014), and Taguchi & Ganbayar (2022) all conclude that they do.

Bagattini (2011) finds that stabilization funds improve fiscal outcomes, emphasizing governance and fund rules as key determinants of success. Sugawara (2014) likewise reports that such funds smooth government expenditure but stresses the importance of political institutions and fiscal rules in mitigating volatility. Taguchi and Ganbayar (2022) confirm the effectiveness of stabilization funds in reducing volatility in both expenditure and the primary balance, again underscoring the role of governance quality. Shabsigh and Ilahi (2007) link oil funds to lower volatility in broad money, prices, and inflation, though they find only a weak negative relationship with real exchange rate volatility.

By contrast, Ossowski et al. (2008) find no evidence of NRF effectiveness, irrespective of the dependent variable used, yet emphasize that institutional quality remains crucial for achieving sound fiscal performance.

Observed differences across studies largely reflect design choices, institutional settings, and measurement approaches. In conclusion, the results across studies are not fully consistent, indicating the need for further empirical verification and more nuanced analysis.

The existing literature lacks an up-to-date and systematically defined identification of resource-rich countries, as well as a comprehensive classification of NRF that accounts for fund type, investment strategy (domestic versus foreign, short- versus long-term), year of establishment, and membership in the International Forum of Sovereign Wealth Funds, signaling adherence to the Santiago Principles. Addressing these gaps constitutes an additional contribution of the present study.

4.2. Resource-rich countries and NRF

In this study, a resource-rich country is defined as an economy predominantly reliant on the extraction and export of natural resources. Based on a critical review of the literature (Auty, 2004; Gelb, 1988; Stevens, 2003; van der Ploeg, 2011), it is assumed that the RC arises exclusively within such economies. Based on the methodology outlined above, the first stage of the analysis identified an initial list of 58 countries.

After conducting a detailed assessment of each country, several were excluded for various reasons. For example, Belarus and Greece, although

they met the threshold, are not major oil producers. Instead, they operate well-developed refining sectors, importing crude oil and exporting refined petroleum products such as gasoline and diesel, which may be statistically classified as raw materials.

Sudan and South Sudan were excluded due to their complex and unstable political and economic environments, the secession of South Sudan in 2011, and the lack of reliable data. Similarly, the Syrian Arab Republic was excluded due to the civil war that began in 2011, which significantly disrupted its export capacity and led to a breakdown in statistical reporting. The exclusion criteria were applied consistently across countries and aimed to ensure conceptual comparability of resource dependence and export structures within the research sample. A few additional countries were also excluded based on similar criteria. As a result, the final research sample consists of 49 resource-rich countries.

These countries were classified by: level of economic development (according to World Bank and IMF classifications), geographic region, type of extracted resources and whether they exceeded the TNRR or TNRE thresholds. The results of this classification are presented in Table 3.

In the next stage of the study, a detailed analysis of NRF operating in the identified group of countries was conducted. A total of 43 NRF were identified. These funds were classified according to: fund type (stabilization, investment, or savings), investment characteristics (domestic vs. foreign; short-term vs. long-term), and membership in the International Forum of Sovereign Wealth Funds, indicating a formal commitment to the Santiago Principles. The results of this classification are presented in Table 4.

This part of the study provides an original contribution to the literature by offering a comprehensive and up-to-date identification and classification of resource-rich countries and the NRF operating within them. The analysis establishes a coherent empirical basis for future quantitative research by combining clearly defined selection criteria with a systematic typology of countries and funds. Presenting the results in a structured tabular form enhances the transparency and replicability of the findings. This methodological groundwork not only fills an existing gap in the literature - where such classifications are often outdated or fragmented - but also creates a consistent reference framework for subsequent empirical verification of the stabilization function of NRF.

Taken together, the results presented in this chapter extend beyond a descriptive synthesis of existing findings and provide a structured analytical basis for future empirical research. The systematic comparison of quantitative studies summarized in Table 2 offers a consolidated overview of dependent and independent variables, volatility transformation methods, control variables, data sources, and research horizons used in prior analyses of NRF stabilization effects. At the same time, the identification and classification

of resource-rich countries (Table 3) and their NRF (Table 4) deliver a clearly defined and up-to-date research sample, enabling informed and consistent design choices for subsequent panel-based econometric studies.

5. Conclusion

The study aimed to build a comprehensive methodological and empirical foundation for analyzing the stabilization function of NRF in counteracting the RC. This objective has been achieved through a three-stage research design that systematically integrates literature synthesis with structured data preparation.

The first stage employed a systematic and critical review of existing empirical research, enabling the identification of dominant methodological approaches, commonly applied indicators, and key sources of heterogeneity in the assessment of NRF effectiveness. This synthesis provides clarity regarding how stabilization effects have been operationalized in prior studies and highlights the methodological choices that shape empirical outcomes.

In the second stage, a research sample of 49 resource-rich economies was identified based on rigorously defined and verifiable criteria derived from reliable data sources, including the World Bank's WDI. These countries were classified by type of resource specialization – fuel or mineral – and by level of economic development. The classification enhances the comparability of future analyses and reduces ambiguity in sample selection.

The third stage focused on identifying and analyzing 43 NRF operating within this group of countries, including their type, investment strategy, and compliance with the Santiago Principles. This structured overview captures the institutional diversity of NRF and provides essential contextual information for empirical modelling.

Taken together, the results of the three analytical stages form a coherent and operational framework that goes beyond descriptive review. The study's contribution lies in consolidating dispersed methodological knowledge, establishing a clearly defined and replicable research sample, and providing the analytical groundwork necessary to formulate specific research assumptions for econometric analysis. As such, the findings offer researchers a ready-to-use foundation for panel-based econometric studies, including guidance on country and fund selection, variable construction, data sources, and modelling strategies.

At the same time, the study is subject to limitations inherent in secondary data synthesis, including reliance on the scope and quality of existing empirical research and data availability. These limitations point to promising avenues for future research, particularly the application of the proposed framework in original econometric analyses of the stabilization effects of NRF.

References

- Allegret, J. P., Benkhodja, M. T., & Razafindrabe, T. (2018) *Monetary policy, oil stabilization fund and the Dutch disease*. GREDEG Working Papers, 06. <https://hal.science/hal01796312/document>
- Auty, R. M. (2004). *Resource Abundance and Economic Development* Resource abundance and economic development. Oxford University Press. <https://doi.org/10.1093/0199275785.001.0001>
- Baena, C., Sévi, B., & Warrack, A. (2012). Funds from non-renewable energy resources: Policy lessons from Alaska and Alberta. *Energy Policy*, 51, 569–577. <https://doi.org/10.1016/j.enpol.2012.08.076>
- Bagattini, G. Y. (2011). *The political economy of stabilization funds: Measuring their success in resource-dependent countries*. IDS Working Paper, 356. <https://www.ids.ac.uk/download.php?file=files/dmfile/Wp356.pdf>
- Barnett, S., & Ossowski, R. (2002). *Operational aspects of fiscal policy in oil-producing countries*. International Monetary Fund Working Papers, 177. <https://doi.org/10.5089/9781451858884.001>
- Chalk, N. A., El-Arian, M. A., Fennell, S. J., Kireyev, A. P., & Wilson, J. F. (1997). *From reconstruction to accumulation for future generations: Kuwait*. Occasional Paper, International Monetary Fund, 150. <https://doi.org/10.5089/9781557756237.084>
- Davis, J., Ossowski, R., Daniel, J., & Barnett, S. (2001). *Stabilization and savings funds for non-renewable resources*. International Monetary Fund, Occasional Paper, 205, 273–315. <https://www.imf.org/external/pubs/nft/op/205/>
- Devlin, J., & Titman, S. (2004). Managing oil price risk in developing countries. *The World Bank Research Observer, World Bank Group*, 19(1), 119–139. <https://doi.org/10.1093/wbro/lkh015>
- Dymitrowska, Y. (2020). Effectiveness of a national resource fund in counteracting the resource curse. *Organization and Management*, 1(49), 23–40. <https://doi.org/10.29119/1899-6116.2020.49.2>
- Dymitrowska, Y. (2023). Savings natural resource funds: Effectiveness of the Norwegian Government Pension Fund Global. *Ekonomia i Prawo. Economics and Law*, 22(3), 471–495. <https://doi.org/10.12775/EiP.2023.026>
- Eifert, B., Gelb, A., & Tallroth, N. B. (2002). *The political economy of fiscal policy and economic management in oil exporting countries*. The World Bank Policy Research Working Paper, 2899. <https://tiny.pl/5bgybc58>
- Engel, E., & Valdés, R. (2000). *Optimal fiscal strategy for oil exporting countries*. International Monetary Fund Working Paper, 118. <https://www.imf.org/external/pubs/ft/wp/2000/wp00118.pdf>
- Fasano-Filho, U. (2000). *Review of the experience with oil stabilization and savings funds in selected countries*. International Monetary Fund Working Papers, 112. <https://doi.org/10.5089/9781451853599.001>

- Gelb, A.H. (1988). *Oil windfalls: blessing or curse?* Oxford University Press, New York.
- Gould, M. (2010). Managing manna from below: Sovereign wealth funds and extractive industries in the Pacific. *Economic Roundup*, 1, 63–86.
- Hjort, J. (2006). Citizen funds and Dutch disease in developing countries. *Resource Policy*, 31(3), 183–191. <https://doi.org/10.1016/j.resourpol.2007.01.001>
- James, A., Retting, T., Shogren, J. F., Watson, B., & Wills, S. (2022). Sovereign wealth funds in theory and practice. *Annual Review of Resource Economics*, 14(1), 621–646. <https://doi.org/10.1146/annurev-resource-111920-015758>
- Kalyuzhnova, Y. (2006). Overcoming the curse of hydrocarbon: Goals and governance in the oil funds of Kazakhstan and Azerbaijan. *Comparative Economic Studies*, 48, 583–613. <https://doi.org/10.1057/palgrave.ces.8100160>
- Le Borgne, E., & Medas, P. (2007). *Sovereign wealth funds in the pacific island countries: Macro-fiscal linkages*. International Monetary Fund Working Papers, 297. <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/SovereignWealth-Funds-in-thePacific-Island-Countries-Macro-Fiscal-Linkages-21519>
- Lücke, M. (2011). Stabilization and savings funds to manage natural resource revenues: Kazakhstan and Azerbaijan versus Norway. *Comparative Economic Studies*, 53, 35–56. <https://doi.org/10.1057/ces.2010.28>
- Merlevede, B., Schoors, K., & van Aarle, B. V. (2009). Russia from bust to boom and back: Oil price, Dutch disease and stabilisation fund. *Comparative Economic Studies*, 51, 213–241. <https://doi.org/10.1057/ces.2009.2>
- Ossowski, R., Villafuerte, M., Medas, P., & Thomas, T. (2008). *Managing the oil revenue boom: The role of fiscal institutions*. International Monetary Fund Occasional Paper, 260. <https://doi.org/10.5089/9781589067189.084>
- Ouoba, Y. (2016). Natural resources: Funds and economic performance of resource-rich countries. *Resource Policy*, 50, 108–116. <https://doi.org/10.1016/j.resourpol.2016.09.003>
- Ouoba, Y. (2020). Natural resources fund types and capital accumulation: A comparative analysis. *Resource Policy*, 66, 101635. <https://doi.org/10.1016/j.resourpol.2020.101635>
- Shabsigh, G., & Ilahi, N. (2007). *Looking beyond the fiscal: Do oil funds bring macroeconomic stability?* International Monetary Fund Working Papers, 096. <https://doi.org/10.5089/9781451866605.001>
- Stevens, P. (2003). *Resource impact: a curse or a blessing?* Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee. https://www.laohamutuk.org/OilWeb/Bground/Transpar/Stevens%20resource%20curseVol14_1.pdf

- Sugawara, N. (2014). *From Volatility to Stability in Expenditure: Stabilization Funds in Resource-Rich Countries*. International Monetary Fund Working Papers, 43. <https://doi.org/10.5089/9781475515275.001>
- SWFI (Sovereign Wealth Fund Institute). (n.d.). Top 100 Largest sovereign wealth fund rankings by total assets. Retrieved May 5, 2025 from <https://www.swfinstitute.org/fund-rankings/sovereign-wealth-fund>
- Taguchi, H., & Ganbayar, J. (2022). Natural resource funds: Their objectives and effectiveness. *Sustainability*, 14(17), 10986. <https://doi.org/10.3390/su141710986>
- Tsani, S. (2013). Natural resources, governance and institutional quality: The role of resource funds. *Resource Policy*, 38(2), 181–195. <https://doi.org/10.1016/j.resourpol.2012.11.001>
- Tsani, S. (2015). On the relationship between resource funds, governance and institutions: Evidence from quantile regression analysis. *Resource Policy*, 44, 94–111. <https://doi.org/10.1016/j.resourpol.2015.01.003>
- Usui, N. (2007). *How Effective Are oil funds? Managing resource windfalls in Azerbaijan and Kazakhstan*. Asian Development Bank Policy. <https://www.adb.org/sites/default/files/publication/28117/pb050.pdf>
- van der Ploeg, F. (2011). Natural resources: Curse or blessing? *Journal of Economic Literature*, 49(2), 366–420. <https://doi.org/10.1257/jel.49.2.366>
- Villafuerte, M., Lopez-Murphy, P., & Ossowski, R. (2010). *Riding the roller coaster: Fiscal policies of nonrenewable resource exporters in Latin America and the Caribbean*. International Monetary Fund Working Paper, 251. <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Riding-the-Roller-Coaster-Fiscal-Policies-of-Nonrenewable-Resource-Exporters-in-Latin-24342>

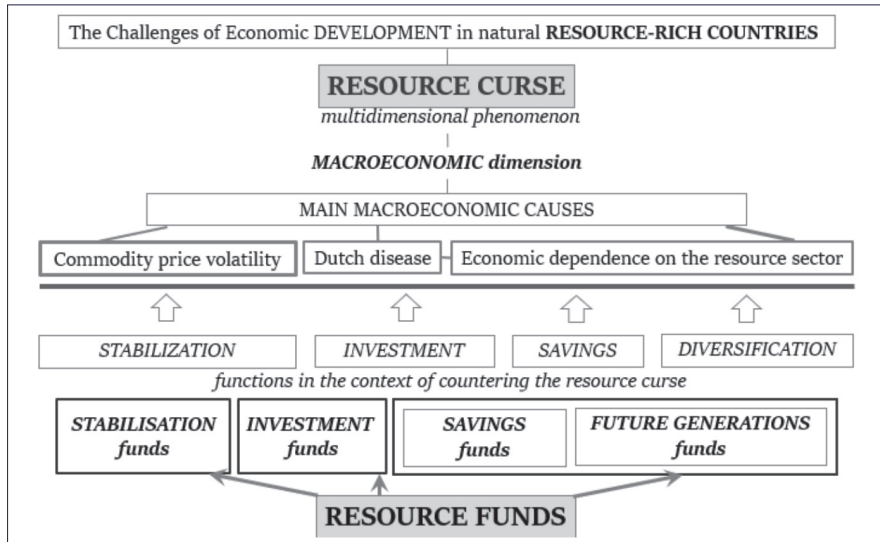
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Appendix

Figure 1. Research concept



Source: Own preparation.

Table 1. Key insights from the SLR

	Descriptive Analyses	Quantitative Analyses
<i>effective, effective under certain conditions</i>	Engel & Valdes (2000); Fasano-Filho (2000); Hjort (2006); Le Borgne & Medas (2007); Usui (2007); Gould (2010); Lücke (2011); Dymitrowska (2020); James et al. (2022);	Shasigh & Ilahi (2007); Merlevede et al. (2009); Bagattini (2011); Sugawara (2014); Allegret et al. (2018); Taguchi & Ganbayar (2022); Dymitrowska (2023);
<i>ineffective, lack of effect</i>	Davis et al. (2001); Eifert et al. (2002); Devlin & Titman (2004); Villafuerte et al. (2010)	Ossowski et al. (2008)

Source: Own preparation.

Table 2. Effectiveness of NRF in performing their stabilization function - review of main quantitative studies

AUTHOR	IEE	DEPENDENT VARIABLES	Sources	Volatility Transformation Method	INDEPENDENT (Explanatory) VARIABLES		Sources	Sample	Period
					main interest	control variables			
Shabsigh & Ilahi (2007)	volatility of inflation, broad money, real exchange rate	1. Coefficient of variation of broad money 2. Consumer price index (CPI) 3. REER 4. Growth rate of CPI	WEO, IFS	Standard deviation of the broad money supply divided by its mean, expressed as a %.	Oil fund dummy variable taking a value of 1 when an oil fund is present and zero when it is not	1. A real GDP growth rate (annual) 2. Share of oil in total Ex 3. Oil price growth rate 4. Financial Depth (broad money to GDP ratio)	WEO, IFS	9 NRF, 15 oil exporting countries	1973-2003
Ossowski et al. (2008)	volatility of government spending	1. Non-oil primary balance 2. Expenditures, annual real growth rate 3. Ratio of the change in expenditure to the change in oil revenue	IMF staff calculations	none	Oil fund dummy variable taking a value of 1 when an oil fund is present and zero when it is not	1. Log (GDP per capita in US\$, lagged) 2. Log of expenditures (% of GDP, lagged) 3. Net government wealth (% of non-oil GDP) 4. Oil revenue (as a % of total revenue) 5. Oil revenue growth (% change) 6. Oil price (lagged) 7. Inflation (lagged) 8. Oil fund net wealth 9. Non-oil primary balance (% of non-oil GDP, lagged) 10. Composite index of institutional quality (ICRG) 11. Democratic accountability 12. Bureaucratic quality 13. Government stability 14. Law and order	IMF staff calculations, ICRG	21 oil exporting countries	1992-2005



AUTHOR	Bagatini (2011)	IEE	sustainable fiscal performance: fiscal revenues, fiscal expenditures and savings; governance	DEPENDENT VARIABLES	Sources	Volatility Transformation Method	INDEPENDENT (Explanatory) VARIABLES		Sources	Sample	Period
			1. Stabilisation fund success variable as a 6-point indicator 2. Non-resource GDP (% of GDP) 3. Non-resource Ex (% of Ex) 4. Government revenues (% of GDP) 5. Non-resource government revenues (% of GDP) 6. Expenditures (% of GDP) 7. Government balance (% of GDP) 8. Non-resource government balance (% of GDP) 9. Public debt (% of GDP)	IMF reports, WDI, WEO and other	none		main interest	control variables	IMF reports, WDI, WEO and other	12 countries with stabilization funds	1992–2007



AUTHOR	Sugawara (2014)
IEE	volatility of government spending
DEPENDENT VARIABLES	1. Volatility of discretionary government expenditure (in logs)
Sources	WEO
Volatility Transformation Method	The log of 5-year moving standard deviation of the residuals from the IV estimation of Equation. The estimation is done by country and excludes country specific business cycle effect.
INDEPENDENT (Explanatory) VARIABLES	
main interest	Dummy variable taking a value of 1 if a stabilization fund exists in the given year (as in logs) 1. Government expenditure (% of GDP, in logs) 2. Population (in logs) 3. GDP <i>per capita</i>, PPP (constant 2005 international \$, in logs) 4. Diversification of Ex products (Theil index: higher, less diversified) 5. Real GDP growth volatility (5-year moving standard deviation, in logs) 6. CPI inflation (%) 7. Liquid liabilities (% of GDP, in logs) 8. Volatility of liquid liabilities (5-year moving standard deviation, in logs) 9. International financial remoteness (distance to financial center, km, in logs) 10. Capital account openness (higher, more openness) 11. Political freedom (higher, less freedom) 12. Political regime (higher, more democratic) 13. Sub-soil resource rents (% of GDP) 14. Number of fiscal rules in place (number) 15. Fiscal rules index (higher, more strengthened) 16. A dummy variable taking a value of 1 if a country is landlocked 17. A dummy variable (taking a value of 1) for an island country 18. A dummy variable that equals 1 if the presidential system is employed
control variables	
Sources	WEO, WDI, UN Comtrade and other
Sample	32 NRF, 68 resource-rich countries
Period	1988–2012



AUTHOR	IEE	DEPENDENT VARIABLES	Sources	Volatility Transformation Method	main interest	INDEPENDENT (Explanatory) VARIABLES control variables	Sources	Sample	Period
Taguchi & Ganbayar (2022)	volatility of government expenditure and primary balance	- General government total expenditure, % of GDP, absolute value of the deviation from the period average - General government primary net lending/borrowing, % of GDP, absolute value of the deviation from the period average	WEO	- Absolute value of the deviation from the period average of "general government total expenditure as a % of gross domestic product (GDP)" - Absolute value of the deviation from the period average of "general government primary net lending/borrowing as a % of GDP"	Stabilization fund dummy: taking a value of 1 if the fund exists in t – 5	- Gross domestic product as constant prices, % change, one lagged - Inflation by average consumer prices, % change, one lagged - Population by millions of persons, log term, one lagged - Sum of Ex and imports of goods and services, % of GDP, one lagged - Total natural resource rents, % of GDP, one lagged - Worldwide governance indicators (WGI, average), from –2.5 (weak) to 2.5 (strong) - Voice and accountability - Political stability and absence of violence/terrorism - Government effectiveness - Regulatory quality - Rule of law - Control of corruption	WEO, WDI, WGI	54 NRE, 41 resource-rich countries	1996–2020

Additional information. **WEO** - World Economic Outlook Databases, International Monetary Fund, **WDI** - World Development Indicators, World Bank, **WGI** - Worldwide Governance Indicators, World Bank, **IFS** - IMF International Finance Statistics, **ICRG** - International Country Risk Guide, **IEE** - Indicators for evaluating the effectiveness of NRF in fulfilling their stabilization function, **CPI** - Consumer price index, **GDP** - Gross Domestic Product, **REER** - Real effective exchange rates, % - percentage, \$ - dollars, **Ex** – export.

Source: Own preparation.



Table 3. Resource-rich countries

	COUNTRY	RESOURCE		RT WB	Classification according to development		Geographical region
					IMF		
1	Algeria	oil, NG		F	UMC	EMDE	MEA
2	Angola	oil, NG		F	LMC	EMDE	SSF
3	Armenia		MI, ME	M	UMC	EMDE	ECS
4	Azerbaijan	oil, NG		F	UMC	EMDE	ECS
5	Bahrain	oil, NG	ME	FM	HIC	EMDE	MEA
6	Bolivia	NG	MI, ME	FM	LMC	EMDE	LCN
7	Brunei Darussalam	oil, NG		F	HIC	EMDE	EAS
8	Cameroon	oil, NG	MI, ME	FM	LMC	EMDE	SSF
9	Canada	oil, NG	MI, ME	FM	HIC	AE	NAC
10	Chile		MI, ME	M	HIC	EMDE	LCN
11	Colombia	oil, coal		F	UMC	EMDE	LCN
12	Congo, Rep.	oil		F	LMC	EMDE	SSF
13	Ecuador	oil		F	UMC	EMDE	LCN
14	Egypt, Arab Rep.	oil, NG	ME	FM	LMC	EMDE	MEA
15	Equatorial Guinea	oil, NG		F	UMC	EMDE	SSF
16	Gabon	oil		F	UMC	EMDE	SSF
17	Georgia		MI, ME	M	UMC	EMDE	ECS
18	Guinea		MI, ME	M	LMC	EMDE	SSF
19	Indonesia	oil, NG, coal	ME	FM	UMC	EMDE	EAS
20	Iran, Islamic Rep.	oil, NG		F	UMC	EMDE	MEA
21	Iraq	oil, NG		F	UMC	EMDE	MEA
22	Jamaica		MI	M	UMC	EMDE	LCN
23	Kazakhstan	oil, NG	MI, ME	FM	UMC	EMDE	ECS
24	Kuwait	oil, NG		F	HIC	EMDE	MEA
25	Lao PDR		MI, ME	M	LMC	EMDE	EAS
26	Libya	oil, NG		F	UMC	EMDE	MEA
27	Mauritania		ME	M	LMC	EMDE	SSF
28	Mongolia	coal	ME	FM	UMC	EMDE	EAS
29	Montenegro		MI, ME	M	UMC	EMDE	ECS
30	Mozambique	NG, coal	MI	FM	LIC	EMDE	SSF
31	Myanmar	NG	MI, ME	FM	LMC	EMDE	EAS
32	Namibia		MI, ME	M	UMC	EMDE	SSF



	COUNTRY	RESOURCE		RT WB	Classification according to development		Geographical region
					IMF		
33	Niger	uranium, oil	MI, ME	FM	LIC	EMDE	SSF
34	Nigeria	oil, NG		<i>F</i>	<i>LMC</i>	<i>EMDE</i>	<i>SSF</i>
35	Norway	oil, NG		F	HIC	AE	ECS
36	Oman	oil, NG		F	HIC	EMDE	MEA
37	Peru	oil, NG	ME	<i>FM</i>	<i>LCN</i>	<i>EMDE</i>	<i>LCN</i>
38	Qatar	oil, NG		F	HIC	EMDE	MEA
39	Russian Federation	oil, NG, coal		F	HIC	EMDE	ECS
40	Rwanda		MI	<i>M</i>	<i>LIC</i>	<i>EMDE</i>	<i>SSF</i>
41	Saudi Arabia	oil, NG		F	HIC	EMDE	MEA
42	South Africa	coal	ME	FM	UMC	EMDE	SSF
43	Trinidad and Tobago	oil, NG		<i>F</i>	<i>HIC</i>	<i>EMDE</i>	<i>LCN</i>
44	Turkmenistan	oil, NG		F	UMC	EMDE	ECS
45	United Arab Emirates	oil, NG		F	HIC	EMDE	MEA
46	Venezuela, RB	oil, NG		F	UMC	<i>EMDE</i>	<i>LCN</i>
47	Yemen, Rep.	oil, NG		F	LIC	EMDE	MEA
48	Zambia		MI, ME	M	LMC	EMDE	SSF
49	Zimbabwe		MI, ME	M	LMC	EMDE	SSF

Additional information. **WB** – World Bank, **IMF** – International Monetary Fund, **TNRR** – total natural resource rent, **TNRE** – total natural resource export, **NG** – natural gas, **MI** – minerals, **ME** – metals, **Italic** – both TNRR and TNRE exceeded the established limit, **No italics** – only TNRE exceeded the established limit, **EAS** – East Asia & Pacific, **ECS** – Europe & Central Asia, **LCN** – Latin America & Caribbean, **MEA** – Middle East & North Africa, **NAC** – North America, **SAS** – South Asia, **SSF** – Sub-Saharan Africa.

WB classification according to development: **LIC** – Low income (\$1,145 or less), **LMC** – Lower middle income (\$1,146 to \$4,515), **UMC** – Upper middle income (\$4,516 to \$14,005), **HIC** – High income (\$14,006 or more).

IMF classification according to development: **AE** – Advanced Economies, **EMDE** – Emerging Market and Developing Economies.

 **M:** ores and metals  **F:** fuels  **FM:** fuels and ores and metals.

Source: Own preparation.



Table 4. Natural resource funds

	COUNTRY	FUND NAME	DATE OF ESTABLISHMENT S	FUND TYPE			INVESTMENT TYPE				ES
				I	SFG	Domestic	International	Short-term	Long-term		
1	Algeria	Revenue Regulation Fund	2000	X			X			X	
2	Angola	Fundo Soberano de Angola	2012			X	X	X		X	X
3	Armenia	none									
4	Azerbaijan	State Oil Fund of the Republic of Azerbaijan	1999			X	X	X	X	X	X
5	Bahrain	Future Generations Reserve Fund	2006			X	X	X		X	
6	Bolivia	none									
7	Brunei Darussalam	Brunei Investment Agency	1983	X	X	X	X	X	X	X	
8	Cameroon	Caisse de Stabilisation des Prix des Hydrocarbures	1974	X			X			X	
9	Canada	Alberta Heritage Savings Trust Fund	1976			X	X	X		X	
10	Chile	Social and Economic Stabilization Fund	1985(2006)	X				X	X	X	X
		Pension Reserve Fund	2006			X	X	X			X
11	Colombia	Colombia Savings and Stabilization Fund	2012	X				X	X		
12	Congo, Rep.	none									
13	Ecuador	none									
14	Egypt, Arab Rep.	none									
15	Equatorial Guinea	Fund for Future Generations	2002			X		X		X	
16	Gabon	Sovereign Wealth Fund of the Gabonese Republic	1998(2012)			X	X	X	X	X	X
17	Georgia	none									
18	Guinea	none									
19	Indonesia	none									



	COUNTRY	FUND NAME	DATE OF ESTABLISHMENT S	FUND TYPE			INVESTMENT TYPE				45
				I	SFG	Domestic	International	Short-term	Long-term		
20	Iran, Islamic Rep.	Oil Stabilization Fund	2000-2010	X			X	X	X		
		National Development Fund of Iran	2011		X		X	X	X	X	
21	Iraq	none									
22	Jamaica	none									
23	Kazakhstan	National Fund of the Republic of Kazakhstan	2000	X				X	X		
		National Investment Corporation	2012			X		X		X	
24	Kuwait	Kuwait Investment Authority	1953			X		X	X	X	
25	Lao PDR	none									
26	Libya	Libyan Investment Authority	2006			X		X	X	X	
27	Mauritania	National Fund for Hydrocarbon Reserve	2006	X							
28	Mongolia	Fiscal Stability Fund	2011	X			X	X	X		
29	Montenegro	none									
30	Mozambique	none									
31	Myanmar	none									
32	Namibia	none									
33	Niger	none									
		Excess Crude Account	2004-2010	X			X	X	X		
34	Nigeria	Stabilization Fund	2011	X			X	X	X		
		The Nigeria Sovereign Investment Authority	2011			X	X	X		X	
		Nigeria Infrastructure Fund	2011		X		X			X	



	COUNTRY	FUND NAME	DATE OF ESTABLISHMENT S	FUND TYPE			INVESTMENT TYPE				as
				I	SFG	Domestic	International	Short-term	Long-term		
35	Norway	Government Pension Fund Global	1990			X			X		X
36	Oman	State General Reserve Fund	1980-2019	X				X	X	X	X
		Oman Investment Fund	2006-2019		X			X	X		X
		Oman Investment Authority	2020			X		X	X		X
		National Development Fund	2020		X		X				X
37	Peru	Fiscal Stabilization Fund	1999	X					X		
38	Qatar	Qatar Investment Authority	2005	X	X	X		X	X		X
39	Russian Federation	Russia's Stabilization Fund	2004-2007	X					X	X	
		Reserve Fund	2008-2018	X					X		
		The National Wealth Fund	2008	X	X	X		X	X		X
40	Rwanda	none									
41	Saudi Arabia	Public Investment Fund	1971		X	X		X	X		X
42	South Africa	none									
43	Trinidad and Tobago	Interim Revenue Stabilization Fund	2000-2006	X					X	X	
		Heritage and Stabilization Fund	2007	X		X		X		X	
44	Turkmenistan	Stabilization Fund	2008	X						X	
45	United Arab Emirates	Abu Dhabi Investment Authority	1976		X	X			X	X	X
		Mubadala Investment Company	2002		X	X		X	X		X
46	Venezuela, RB	Macroeconomic Stabilization	1998-2003	X					X	X	
		Fondo de Desarrollo Nacional	2005		X		X		X	X	



	COUNTRY	FUND NAME	DATE OF ESTABLISHMENT S	FUND TYPE			INVESTMENT TYPE			dS
				I	SFG	Domestic	International	Short-term	Long-term	
47	Yemen, Rep.	none								
48	Zambia	none								
49	Zimbabwe	Mutapa Investment Fund	2014	X	X		X		X	

Additional information. **S** - stabilization funds, **I** - investment funds, **SFG** – savings funds (funds for future generations), **SP** - Compliance with the Santiago Principles.

Source: Own preparation based on the data provided by the Natural Resource Governance Institute, International Forum of Sovereign Wealth Funds, Sovereign Wealth Fund Institute and official websites of individual funds.



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The evolution of economic models in the context of global change: the transition to a green economy as a means of achieving sustainable development

MAGDALENA BYCZKOWSKA

corresponding author

Economics Department, The Jacob of Paradyż Academy,

66-400 Gorzów Wielkopolski ul. Chopina 52

✉ mbyczkowska@ajp.edu.pl

 ORCID: 0000 0003 2718 2863

Abstract

Motivation: Contemporary economies face overlapping crises—climate, social, and commodity—that challenge the adequacy of traditional development models. There is a need to critically assess whether new concepts represent a genuine paradigm shift or merely adapt existing frameworks.

Aim: This article analyses the evolution of economic development models amid global systemic transformation, emphasizing the green economy as a tool to achieve the overarching paradigm of sustainable development.

Results: The study identifies key drivers and challenges in transitioning from a green economy to sustainable development. It underscores the importance of a holistic approach, integrating economic, social, and environmental aspects, and provides a theoretical and empirical basis for further research and practical recommendations for policymakers and practitioners.

Keywords: evolution of economic models, green economy, sustainable development, circular economy, doughnut economics, degrowth, sustainability transition, economic innovation

JEL Classification: F01; F02; F41

1. Introduction

In the face of growing global challenges such as climate change, environmental degradation, social inequalities and resource constraints, contemporary models of economic development require fundamental revision. Traditional approaches based on unlimited GDP growth, exploitation of natural resources and linear production and consumption processes are proving increasingly ineffective in ensuring long-term economic and social stability. In response to these phenomena, economic systems are evolving towards models that integrate environmental, social and economic objectives, which is at the core of the sustainable development paradigm.

In this context, the green economy is emerging as a key mechanism for systemic transformation, allowing for the harmonisation of economic interests with environmental protection requirements and social needs. It is based on innovative technological solutions, energy efficiency, greenhouse gas emission reduction and responsible use of natural resources, while stimulating new forms of employment and business models. An analysis of the evolution of contemporary economic models in this regard not only allows us to understand the dynamics of global transformation, but also points to directions for public policy and corporate strategies that can effectively integrate sustainable development goals with the requirements of competitiveness and innovation. Despite the extensive literature on the green economy and sustainable development, the relationship between the green economy and new alternative development models—such as doughnut economics, the circular economy, and degrowth—remains insufficiently explored. Previous research has focused primarily on analyzing individual concepts in isolation, overlooking their interconnections and significance for the evolution of contemporary economic models. This article fills this gap through a comprehensive analysis of the green economy's role in the broader process of transforming the development paradigm toward sustainable development. The aim of this article is therefore to examine in detail the transformations of contemporary economic systems, taking into account the mechanisms for implementing the green economy, and to assess its role as a tool for achieving sustainable development in the context of global systemic transformation. Particular attention will be paid to analysing the links between environmental policy, market structure and innovation processes, which will allow us to

present the green economy not only as an ecological concept, but also as an integral component of modern economic development models.

Despite the growing body of literature on green economy and sustainable development, there is still a significant research gap regarding the interrelationships between green economy and emerging alternative development paradigms, particularly doughnut economics, circular economy, and de-growth. Existing studies typically analyse these concepts separately, without sufficiently exploring their mutual complementarities and their collective contribution to the transformation of contemporary economic systems.

Therefore, the main objective of this study is to identify the role of green economy in the broader evolution of economic development paradigms and to assess its significance as a transitional mechanism towards sustainable development.

To achieve this objective, the following research questions were formulated:

1. How does the green economy relate to contemporary alternative development paradigms?
2. What factors determine the effectiveness of the transition towards sustainable development?
3. What practical implications arise for policymakers and business leaders?

The novelty of this study lies in integrating these approaches into a coherent analytical framework that captures the systemic evolution of economic models under contemporary global challenges.

2. Literature review

Classical economic paradigms such as capitalism, socialism and Keynesianism, form the theoretical foundation of contemporary economic analyses that have long determined the development trajectories of economies at the national and global levels. Each of these models refers to different assumptions about the organisation of the processes of production, wealth distribution and resource management, differentiated according to the role attributed to the state and the market. Capitalism, in its clichéd form, is based on the free market, private property and mini-minimal state intervention. This model, derived from the work of Adam Smith, assumes that free competition leads to an efficient allocation of resources and promotes economic growth (Smith, 1776, p. 16). However, contemporary critiques of capitalism point to numerous flaws in this system, such as growing social inequality, the concentration of capital in the hands of a few and the exploitation of natural resources, which leads to environmental problems and social destabilisation (Piketty, 2014, p. 187; Stiglitz, 2020, pp. 122–124). In addition, the 2008

financial crisis revealed the structural flaws of capitalism, such as excessive financial speculation and the lack of accountability of financial institutions (Krugman, 2009, pp. 325–327).

Socialism, on the other hand, promotes central planning of the economy, state control over the means of production and the pursuit of social equality. In theory, this model aims to eliminate inequality, but its practical implementation in the 20th century revealed numerous flaws, such as bureaucratisation, lack of innovation and inefficiencies in resource allocation (Mises, 1998, pp. 234–235). Contemporary research suggests that central planning, while it may improve some aspects of equality, often provides problems with efficiency and innovation (Blanchard, 2013, pp. 117–120; Stiglitz, 2013, pp. 383–387). Keynesianism, on the other hand, based on the theory of John Maynard Keynes, emphasises state interventionism, especially in times of economic crises. This model assumes that the state should engage in fiscal and monetary policy to stabilise economic cycles and ensure full employment (Keynes, 2018, pp. 28–30). Despite the successes in the post-World War II period, critics of Keynesianism point out the potential dangers of long-term public debt and inflation that can result from excessive state interference in the economy. Contemporary research points to the need to rethink state intervention in the context of new challenges such as climate change and globalisation processes (UNEP, 2022; European Commission, 2021). Despite their theoretical merits, classical economic models based on economic growth and traditional economic indicators have significant limitations in the context of contemporary issues such as the climate crisis, social change and globalisation (Barbier, 2010, pp. 665–675; Stern, 2007, p. 14). These references show that there is a need to introduce new concepts, such as the green economy and sustainable development, which integrate environmental, social and economic aspects.

Today, phenomena such as climate change, natural resource degradation, growing social inequalities and loss of biodiversity are forcing a fundamental reformulation of the basic assumptions of economic theory. In response to these crises, innovative paradigms in economic thought are emerging that emphasise the need to transform the existing model of economic growth. Two important approaches that are gaining prominence in this context are the green economy and sustainable development, which offer alternatives to traditional models based on the exploitation of natural resources and unlimited growth.

The green economy is an approach that integrates economic and environmental objectives, focusing on minimising the negative impacts of economic activity on ecosystems. Unlike traditional economic models, the green economy seeks to create a system of production and consumption that meets human needs while minimising resource use and environmental pollution (UNEP, 2011). As Jackson (2011) and Sachs (2015) note, a key element of the

green economy is the development of environmentally friendly technologies, as well as the transition to a circular economy model that treats waste as a resource. Sustainability, on the other hand, which gained popularity with the Brundtland Report, has become a cornerstone of contemporary development policies. Sustainable development is a concept that implies the harmonious integration of three basic pillars: economic, social and environmental. The goal of sustainable development is to ensure the well-being of current generations without jeopardising the development opportunities of future generations (Brundtland, 1987). As Sachs (2015) notes, global challenges, such as climate change and social inequality, require an integrated approach to economic policy that considers both environmental and social justice aspects. Sustainable development points to the need for structural changes in the global economy, such as promoting development based on social justice and environmental care, while taking into account economic needs. From this point of view, sustainable development is not only an end in itself, but also a process that engages both the public and private sectors in pursuit of environmental, economic and social goals. A comparison of the two paradigms is presented in Table 1, highlighting their key assumptions, main characteristics, and practical implications. This comparison provides a basis for understanding the differences between the traditional and emerging approaches to development.

Undoubtedly, the transition from a green economy to sustainable development represents an evolution of the development paradigm - from a technocratic approach focusing on environmental performance and innovation, to a holistic concept integrating ecological, social and economic objectives. Sustainable development includes not only the decarbonisation of the economy and the conservation of natural resources, but also strives for social equity, inclusiveness and improved quality of life. It requires a systemic approach that assumes interdependence and balance between environment, economy and society.

Increasing anthropogenic challenges, such as climate change, widening socio-economic inequalities, degradation of ecosystems and pressure on scarce natural resources, heighten the importance of alternative development models. The literature increasingly points to the need for systemic transformation, in which concepts such as doughnut economics, circular economy and degrowth play a key role (Raworth, 2017, pp. 118–121; Kallis, 2018, pp. 65–67). Researchers emphasise that the implementation of these concepts allows for the integration of economic, environmental and social aspects, contributing to the achievement of sustainable development goals and a better response to global challenges such as the climate crisis and growing social inequalities (UNEP, 2011; European Commission, 2021). These models redefine the fundamental goals of development policy and the mechanisms of contemporary economic systems, proposing approaches

focused on planetary boundaries, regenerative resource cycles and social well-being as alternatives to the metric of GDP growth.

The concept of a ring-fence economy, formulated by Kate Raworth as part of her doughnut economics theory, is an alternative framework for the 21st-century economy, combining social goals with environmental constraints (Raworth, 2017, p. 133). This model assumes the need for the economy to operate within a so-called ‘safe and equitable operating space,’ defined by two boundaries: an inner boundary – setting minimum standards of social well-being (i.e. access to basic goods and services such as food, water, education, healthcare, gender equality, etc.), and an outer boundary – corresponding to planetary boundaries, defined by critical thresholds for the functioning of the Earth system, such as climate stability, biosphere integrity or biogeochemical cycles (Ross, 2019, p. 82) – Figure 1.

The graphical model takes the shape of a ring, the central gap of which symbolises social deficits, while the area beyond the outer edge represents the transgression of ecological limits. The goal of functioning economic systems should therefore not be to maximise production or GDP growth, but to ensure that development takes place within this ‘ring’ – i.e. in a way that does not violate planetary boundaries, while eliminating poverty and promoting inclusivity (Raworth, 2017; p. 113). Circular economics thus provides a critique of the dominant economic orthodoxy, advocating a move away from linear models of growth towards regenerative and distributive systems in which production and consumption processes are subordinated to principles of socio-ecological justice. As Katherine Trebeck and Jeremy Williams (2023) argue, according to this conception, economic development should not be an end in itself, but a tool to maintain the conditions that enable the long-term well-being of both humans and the biosphere.

The circular economy, on the other hand, is one of the key alternative approaches to the dominant linear economy model, based on the “extraction-production-consumption-disposal” scheme. Its sub-principle is to move towards a regenerative model, in which material and energy cycles are as closed as possible and the value of resources is kept in circulation for as long as possible through reuse, repair, upgrading, recycling and recovery (Ellen MacArthur Foundation, 2013, pp. 7–8). The concept originates from an interdisciplinary combination of such trends as cradle-to-cradle, industrial ecology, regenerative design and functional economics. The contemporary circular economy implies not only efficient waste management, but above all a systemic redesign of production and consumption processes in the direction of minimising negative environmental impacts and maximising material efficiency (Geissdoerfer, Savaget, Bocken, & Hultink, 2017, pp. 757–768). Strategically, the circular economy is gaining increasing importance in the development policies of many countries and inter-national organisations. One example is the European Union, which, within the framework of the

European Green Deal and the adopted Circular Economy Action Plan (2020), treats this model as one of the pillars of the transformation towards climate neutrality, raw material efficiency and industrial innovation (European Commission, 2020). In line with this approach, the transition towards a circular economy not only contributes to reducing greenhouse gas emissions and resource consumption, but also generates new jobs, strengthens economic resilience and supports the creation of local production ecosystems. However, the literature points out that the successful implementation of this modality requires not only technological changes, but also profound institutional transformations, business models, market structures and consumer attitudes.

Finally, degrowth is an economic and social concept and an interdisciplinary research strand that questions the legitimacy of continued economic growth as the main goal of public policy, especially in the context of highly developed countries. As Giorgos Kallis (2018) writes, this idea should be understood not as a negation of development, but as a proposal for its redefinition – moving away from quantitative measures such as gross domestic product towards quality of life, social justice and ecological sustainability. The basic premise of degrowth is the belief that further economic expansion in societies already meeting basic needs does not lead to improved well-being, but in fact contributes to environmental degradation, increased inequality and destabilisation of social and natural systems (Jackson, 2009, pp. 49–52). Proponents of degrowth in literature point to the need to transform production and consumption systems towards slowing down the pace of economic metabolism, limiting the exploitation of natural resources, and reorganising socio-economic life based on values such as sharing, localism, solidarity, and autonomy (Kallis, 2018, pp. 234–236). In practice, the concept of degrowth promotes, among other things, shorter working hours, redistribution of income and resources, support for local economies, development of public services, and democratisation of economic decisions (Demaria et al., 2013, pp. 191–215). This concept is linked to a critique of capitalism and the logic of accumulation, offering a vision of an economy that stays within the ecological limits of the Earth while enabling a dignified and stable life for all members of society. In summary, doughnut economics, circular economy and degrowth offer alternative approaches to the traditional economic growth model, proposing sustainable development that takes into account both planetary boundaries and social justice. All three concepts focus on regenerating resources, reducing environmental exploitation and improving quality of life, rather than the relentless pursuit of GDP growth, emphasising the need for deep economic and social transformations.

The global transformation towards sustainable development is a complex and multifaceted process in which both exogenous and endogenous factors play a key role. Exogenous factors are those that come from external sources and are not directly controlled by a country's economic and social

systems. These include environmental crises, climate change, globalisation, as well as international policies and agreements such as the Paris Agreement or the 2030 Agenda for Sustainable Development. Endogenous factors, or internal factors, on the other hand, refer to the social, economic, political and technological conditions that shape the ability of countries, regions and cities to transform their economic systems in a way that promotes sustainable development. The transformation towards sustainability is not a linear process and requires the involvement of both public and private „actors“. In the context of the challenges posed by the global transformation, international institutions, national governments, local governments, NGOs as well as the private sector play an important role. Contemporary sustainability policies, such as the European Green Deal, which is a response to the climate and environmental crisis, point to the need to integrate action at different levels - from global to national to local. As part of the European Green Deal, the European Union is prioritising decarbonisation of the economy, energy transition, biodiversity protection and sustainable production and consumption with the aim of achieving climate neutrality by 2050 (European Commission, 2019). In particular, the private sector plays a significant role in creating technological innovations and implementing solutions that support sustainable development goals (UNEP, 2011; OECD, 2020). Companies, both in manufacturing and services, can make changes to their operational processes, changing the way they produce, distribute and consume (European Commission, 2021). In addition, public-private partnerships are an effective way to support transformation, particularly in the areas of infrastructure and technological innovation (World Bank, 2020).

In the context of the global transition towards sustainable development, examples of good practice play an important role in showing how specific policies, strategies and actions can contribute to the implementation of sustainable development principles. Examples of cities based on circular economy concepts provide inspiration for the introduction of more equitable, sustainable and resilient socio-economic systems (Ellen MacArthur Foundation, 2021). The city of Amsterdam is one of the leaders in implementing the circular economy at the municipal level. As part of its strategy, Amsterdam is committed to promoting a recycling-based economy, waste minimisation and maximum resource utilisation in order to build a more resilient urban economy (Ellen MacArthur Foundation, 2021). These activities include

This transformation is supported by public policies and private investments that combine environmental and economic objectives (European Commission, 2019).

In the face of the growing environmental, economic and social challenges of the 21st century, the need for a paradigmatic transformation in development thinking is becoming increasingly urgent. In this context, the desk research method, based on the analysis of secondary data from reliable

sources such as reports from international organisations, is an invaluable tool in identifying the main factors shaping this transformation. In particular, an examination of documents produced by organisations such as the United Nations Environment Programme (UNEP), the Organisation for Economic Cooperation and Development (OECD), the World Bank and the European Commission provides insights into current policy priorities and development strategy at global and regional levels. The analysis of the documents points to several key factors that determine the paradigm shift in development thinking.

Above all, the need to integrate environmental goals with social and economic objectives to ensure long-term sustainability and equity has been increasingly emphasised in recent years. UNEP and OECD reports point to the need to move from the traditional economic growth model, which focuses on measures such as Gross Domestic Product (GDP), to more complex indicators that take into account social well-being, social equity, quality of life and the state of ecosystems [OECD, 2020; UNEP, 2020]. In this context, concepts such as the circular economy, which postulates the need to set planetary boundaries for human activity while ensuring that basic social needs are met, play a leading role. One of the key findings from the analysis of the documents is the increasing role of technological innovation and circular economy models in transformational processes. On the one hand, technologies based on renewable energy sources, energy efficiency and recycling are the foundations of decarbonisation strategies for economies. On the other hand, reports point to the need to implement systems that integrate technology with policies of a social and environmental nature to reduce social inequalities and strengthen economic resilience in the face of crises [World Bank, 2020; OECD, 2020]. Another important element is the role of international agreements and national policies in initiating and supporting paradigmatic transformation. In particular, initiatives such as the 2030 Agenda for Sustainable Development and the European Green Deal are key mechanisms that enable global coordination of environmental, social justice and economic development efforts. International organisations such as the World Bank play a key role in developing policies that support the integration of sustainable development efforts at the national level. Their reports show that investment in sustainable infrastructure, „clean development“ technologies and strengthening biodiversity conservation policies are essential to achieving global sustainable development goals [World Bank, 2020]. The OECD, in turn, highlights the importance of integrating climate policies with economic and social policies, in order to minimise the risk of environmental and economic crises [OECD, 2020].

3. Methods

Due to the nature of the research objective, a qualitative approach was used, employing three complementary methods: critical literature review, comparative analysis, and secondary data analysis. The choice of methods is consistent with the literature on qualitative research in economics and social sciences (e.g., Yin, 2018; Flick, 2018; Saunders, Lewis, Thornhill, 2019).

The critical review of the literature included the following stages:

- I. Identification and selection of literature relevant to the research topic, including classic theoretical works, recent scientific articles, and reports from international institutions.
- II. Critical analysis of the content of the sources in terms of their relevance to the evolution of economic models, the green economy and sustainable development.
- III. Synthesis of the results of the analysis to identify major trends, research gaps and directions for the development of theory.

The literature review was conducted using a systematic search for scientific sources in the Scopus, Web of Science, and Google Scholar databases. The following keywords were used: 'green economy', 'sustainable development', 'circular economy', 'doughnut economics', 'degrowth'. Publications from 2010–2025 that met the criteria of high citation frequency and a direct connection to the research topic were included in the analysis.

The comparative analysis included:

- I. Selection of economic models and sustainable development concepts for comparison.
- II. Definition of evaluation criteria, such as relevance to contemporary global challenges, effectiveness in practice, and integration of social, environmental, and economic aspects.
- III. Compilation of models in comparative tables and analysis of differences and similarities between approaches.
- IV. Drawing conclusions about the strengths and weaknesses of each model and identifying opportunities for adaptation in practice.

Source research (secondary data analysis) included:

1. Selection and verification of data from reports by international organisations (UNEP, OECD, World Bank).
2. Extraction of information on global trends, policies and strategies related to the green economy and sustainable development.
3. Analysis of the collected data in terms of its significance for the paradigm shift in thinking about economic development.
4. Synthesis of the results in the form of conclusions and recommendations, indicating practical implications for economic policy and business strategy.

The comparative analysis covered four development models: the green economy, the circular economy, doughnut economics, and degrowth. The comparison was based on five criteria: environmental focus, social integration, approach to economic growth, level of public intervention, and implementation potential.

The choice of methods and detailed description of the stages of the research procedure allow for transparency of the research process, a clear link between the methods and the results, and a holistic view of the phenomenon under study, integrating economic, social and environmental aspects.

Each research method served a distinct analytical purpose. The critical literature review enabled the identification of theoretical foundations and research gaps. Comparative analysis facilitated the systematic evaluation of alternative development paradigms. Secondary data analysis provided empirical support for identifying key determinants and practical implications of sustainable transformation table.

4. Results

The article analyzes the global transition towards sustainability, focusing on three contemporary paradigms: **circular economics, circular economy, and degrowth**:

- I. The results indicate the need to move away from the traditional growth model based on unlimited GDP towards **more sustainable and holistic approaches** that integrate environmental, social, and economic aspects.
- II. These models can address global challenges such as the **climate crisis, social inequalities, and natural resource depletion**.
- III. Promoting the **integration of environmental, social, and economic policies** is essential for effectively achieving sustainable development goals (e.g., the European Green Deal).
- IV. In the economic context, implementing **circular economy models and technological innovations**, especially in renewable energy and energy efficiency, is crucial.
- V. The article refers to other authors' research (e.g., Raworth, 2017, Jackson 2009, Kallis, 2018), highlighting the need to integrate social and economic policies with environmental policies and to transition towards a degrowth approach.
- VI. **Study limitations**: reliance on secondary data, incomplete data from developing countries, focus on reports from international organizations, limited number of regions analyzed.

The analysis confirms that the success of the transition toward sustainable development depends primarily on the quality of institutions, the level of

technological innovation, access to financing, public acceptance, and regulatory stability. These factors determine the feasibility of implementing models such as the green economy, the circular economy, doughnut economics, and degrowth.

The analysis also identified five key factors determining the effectiveness of economic transformation:

- The quality of public institutions – high-quality institutions increase the effectiveness of implementing transformation policies.
- The level of technological innovation – accelerates the decarbonization process and increases resource efficiency.
- Public acceptance – determines the sustainability and scale of the reforms implemented.
- Availability of financing for green investments – determines the pace of the transition.
- Regulatory consistency – reduces investment risk and supports long-term decisions by economic actors.

Technological innovation and the quality of institutions have the strongest impact on the success of the transition.

Recommendations for future research:

- Analyze the impact of local conditions on the effectiveness of sustainable development models, particularly in developing countries.
- Conduct primary research to assess local strategies and practices for implementing circular economy and other modern development paradigms.
- Study public–private cooperation to accelerate the achievement of sustainable development goals.
- Adapt global initiatives to the specific needs and challenges of individual countries and regions.

5. Discussion

The findings confirm and extend previous research on sustainability transitions. Consistent with Raworth (Raworth, 2017), the analysis demonstrates that contemporary economic systems must operate within planetary boundaries while ensuring social inclusion. The results also support Jackson's (Jackson, 2009) argument that unlimited GDP growth is incompatible with long-term ecological stability.

Furthermore, the study corroborates Kallis's (Kallis, 2018) proposition that alternative economic paradigms require structural changes in production, consumption, and governance systems. Compared with earlier studies, this article contributes by integrating green economy, circular economy, doughnut economics, and degrowth into a unified analytical framework.

The analysis highlights that successful transformation depends not only on technological advancement but also on institutional capacity, policy coherence, and public acceptance.

References

- Barbier, E.B. (2010). Green Economy and Sustainable Development: Policy Issues and Research Needs. *Environment and Development Economics*, 15(6). doi.org/10.1017/S1355770X1000064X
- Blanchard, O., & Leigh, D. (2013), Growth Forecast Errors and Fiscal Multipliers, *American Economic Review*, 103(3). <https://doi.org/10.5089/9781475576443.001>.
- Brundtland, G. H. (1987), Our Common Future. World Commission on Environment and Development, UN. Secretary-General European. Commission. (2020). Circular Economy Action Plan: For a Cleaner and More Competitive Europe. Brussels.
- Demaria, F., Schneider, F., Sekulova, F., & Martinez-Alier, J. (2013). What is Degrowth? From an Activist Slogan to a Social Movement. *Environmental Values*, 22(2). <https://doi.org/10.3197/096327113X13581561725194>
- European Commission. (2019). The European Green Deal. Brussels. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/story-von-der-leyen-commission/european-green-deal_en (11.02.2025).
- European Commission. (2021). *A European Green Deal: Striving for a Sustainable Future*. Brussels: European Commission.
- Flick, U. (2018). *An Introduction to Qualitative Research* (6th ed.). London: Sage Publications ISBN (Print): 978-1-5264-3607-2.
- Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? *Journal of Cleaner Production*, Vol. 143/2017, doi.org/10.1016/j.jclepro.2016.12.048.
- Jackson, T. (2011). Prosperity Without Growth: Economics for a Finite Planet, *Energy & Environment*. <https://doi.org/10.1260/0958-305X.22.7.1013>
- Kallis, G. (2018). Degrowth. Agenda Publishing. doi.org/10.2307/j.ctv5cg82g <https://doi.org/10.1017/9781911116813>
- Krugman, P. (2009), The Return of Depression Economics and the Crisis of 2008, *Journal of Real Estate Literature* Vol. 17, No. 2 (2009).
- Mises, L. von (1998). Human Action: A Treatise on Economics. Yale University, Alabama 1998 ISBN (Print): 978-0-940600-54-8.
- OECD (2020). The Future of Work: Employment Outlook 2020. OECD Publishing.
- Piketty, T. (2014). Capital in the Twenty-First Century. Cambridge, Massachusetts London, England. <https://doi.org/10.4159/9780674369542>
- Raworth, K. (2017), Doughnut Economics: Seven Ways to Think Like a 21st-

- Century Economist. Penguin Random House, London UK, 2017. ISBN (Print): 978-1-84614-923-7.
- Ross F., Raworth K. Doughnut economics: seven ways to think like a 21st century economist, *Regional and Business Studies* (2019) Vol. 11, No. 2. <https://doi.org/10.33568/rbs.2409>
- Sachs, J. D. (2015). The Age of Sustainable Development. New York: Columbia University Press, doi.org/10.7312/sach17314
- Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students* (8th ed.). Harlow: Pearson Education. ISBN (Print): 978-1-292-26805-8.
- Smith A. (1977). *An Inquiry into the Nature and Causes of the Wealth of Nations*; University of Chicago Press. <https://doi.org/10.7208/chicago/9780226763750.001.0001>
- Stiglitz, J. E. (2020), People, Power, and Profits: Progressive Capitalism for an Age of Discontent, *Sri Lanka Journal of Economic Research* Volume 7 (2) June 2020. <https://doi.org/10.4038/sljer.v7i2.119>
- Stiglitz, J. E. (2013), *The Price of Inequality: How Today's Divided Society Endangers Our Future*, W.W. Norton & Company US 2013. ISBN (Print): 978-0-393-34505-7
- Stern, N. (2007). *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511817434>
- Trebeck, K. & Williams, J. (2023), *The Economics of Arrival: Ideas for a Grown-Up Economy*, Bristol University Press, UK 2023. <https://doi.org/10.46692/9781447337843>
- United Nations Environment Programme (UNEP). (2011). *Towards a green economy: Pathways to sustainable development and poverty eradication – A synthesis for policy makers*. https://sustainabledevelopment.un.org/content/documents/126GER_synthesis_en.pdf
- United Nations Environment Programme (UNEP). (2019). *Global environment outlook: Regional assessments*. Nairobi, Kenya: UNEP.
- United Nations Environment Programme (UNEP). (2020). *Emissions gap report 2020*. Nairobi, Kenya: UNEP.
- United Nations Environment Programme (UNEP). (2022). *Global environment outlook – GEO-6: Healthy planet, healthy people*. Nairobi, Kenya: UNEP.
- World Bank (2020). *World Development Report 2020: The Changing Nature of Work*. World Bank Group.
- Yin, R.K. (2018). *Case Study Research and Applications: Design and Methods* (6th ed.). Thousand Oaks, CA: Sage Publications. ISBN-13: 978-1506336169

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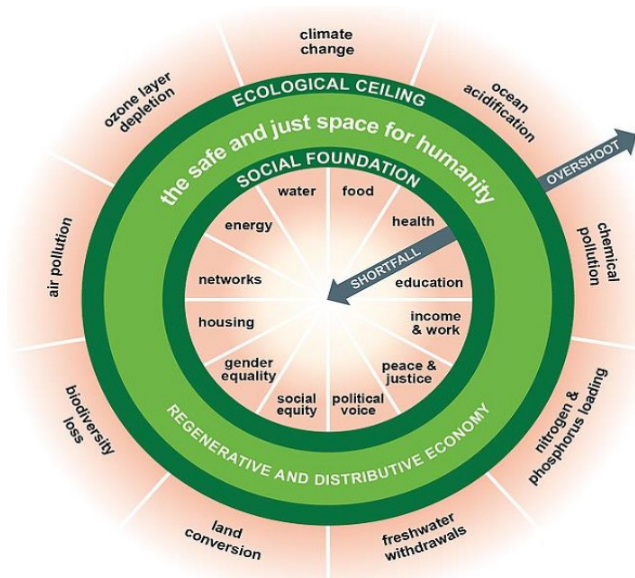
Appendix

Table 1. Green economy and sustainable development

Criteria	Green economy	Sustainable development
Basic objectives	Reduction of greenhouse gas emissions, reduction of raw material consumption, promotion of renewable energy sources.	Balancing environmental, social and economic aspects in pursuit of long-term development.
The environmental aspect	A focus on environmental protection through reduced emissions, recycling and resource efficiency.	A sustainable economy is based on environmental protection, but also takes into account other aspects such as social equity and economic justice.
The economic aspect	Shifts towards sustainable production, more efficient use of resources and minimisation of waste.	Economic growth must not be at the expense of the environment, it is necessary to take into account the long-wave economic effects.
The social aspect	Improving quality of life through green jobs, eco-innovation and access to cleaner resources.	Social justice, poverty eradication, equal opportunities and education for all.

Source: own elaboration based on (Barbier, E.B., 2010, p. 665–685).

Figure 1. The economics of the doughnut



Source: own compilation based on: (Ross, 2019, p. 83).