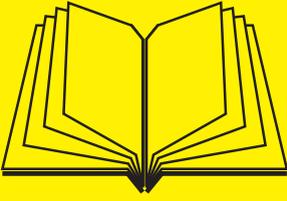


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There has been the seventeenth year of the Acta Scientiarum Polonorum. Oeconomia publishing. The Acta is the periodical including several thematic series with uniform graphics and similar format. The publication was set up by group of enthusiasts – employees of life sciences universities and has been published under the patronage of rectors of these universities. Constant involvement of academic society in increasing substantive and editorial level of the series, with efforts of the authors, the Programming Board and the Scientific Boards, has contributed to placing the Acta Scientiarum Polonorum (and our Oeconomia series) on the noticeable position in academic research society. Articles can be prepared in English with Polish title, abstract and keywords. Moreover, we publish latest issues in English only. The Scientific Board of the Oeconomia series, concerning the publication range, focuses its attention both on substantive content and precision of the form. The articles are revised in “double-blind review” process. Whole content of the Acta Scientiarum Polonorum. Oeconomia is available in electronic version on the following websites acta_oeconomia.sggw.pl and www.oeconomia.actapol.net. We are glad to inform that Acta Scientiarum Polonorum Oeconomia are indexed within the AGRIS-FAO, EBSCO, SIGŹ, Copernicus Index, Central and Eastern European Online Library, AGRO, BazEkon, POL-index. Since 2015 each article published in Acta Sci. Pol. Oeconomia has 15 points at the Ministry of Science and Higher Education ranking list.

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*Prof. dr hab. Janina Sawicka
Department of European Policy and Marketing
Faculty of Economic Sciences
Warsaw University of Life Sciences – SGGW
Nowoursynowska 166, 02-787 Warsaw, Poland
tel.: (+4822) 593 40 70; fax: (+4822) 593 40 77*

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FILM TOURISM IN THE PROMOTION OF SELECTED TOURIST DESTINATIONS

Wioletta Bieńkowska-Gołasa  

Warsaw University of Life Sciences – SGGW

ABSTRACT

Film tourism is a phenomenon which is not very well known but developing together with new film productions and people's increasing interest in this area. The film is to some extent a new promotion tool which uses a filmed image to show places and stories on purpose and in a way which is adjusted to the audience. This can later encourage people to go to a certain destination.

The aim of the article was to find out whether film tourism influenced the promotion of selected tourist destinations. It was done by means of the method of diagnostic survey with the use of the technique of a standardized questionnaire. The results of the research in reference to film tourism in the promotion of tourist destinations indicate that it is a phenomenon that should be further promoted. It is because nearly 50% of the respondents encountered the term "film tourism".

Key words: promotion, film tourism, tourist destination

INTRODUCTION

Film tourism has a huge potential and the area of research on this phenomenon, which is emerging now, reflects its interdisciplinarity [Beeton 2010]. Film tourism is of the interest of tourism sciences (investigating the effects of growth, management), cultural geography (where focus is put on landscape, the nature, culture of a particular place), psychology (social psychology and neuropsychology), marketing (watching customers' behaviour, the influence of brand, image and promotion) or film and media studies (cinematography, film theory, media studies) [Beeton 2011]. The phenomenon of visiting places known from the screen is called set-jetting. Its goal is above all to reach locations where one's favourite films are set, search for their atmosphere and climate or visit the facilities, constructions and areas shown in a film. Out of many definitions of film tourism which are presented in

the source literature, the one stating that film tourism covers tourist flows caused by a film/film production is the most recognized. These flows are related to a particular geographical space of a place, region (landscape, scenery), the location of a film production studio or attributes connected to a specific film or series [Beeton 2005].

Film tourism can be considered as an element of the broadly understood cultural tourism, which is at present a significant factor as far as travelling motivation is concerned. Apart from monuments and historical sites, people are also interested in the aspects of high and popular culture. Apart from tradition, it is also important to get to know the atmosphere of a place. There are numerous definitions which describe culture as the totality of human products, both tangible and intangible ones, which influence people's personalities and their lives. Cultural tourism is developing in various forms, they are: trips to cities, field

Wioletta Bieńkowska-Gołasa  <https://orcid.org/0000-0003-1654-390X>

 wioletta_bienkowska@sggw.pl

trips, language trips, theme trips and theme routes. The development of new media is of great importance to cultural tourism: using the Internet can give easy access to any kind of products and cultural events [Gaworecki 2007]. The source literature breaks down cultural tourism in many more or less detailed ways. In older publications, there are no greater mentions of film tourism or film art itself as an element of cultural tourism. It happens, however, that a breakdown covers literary tourism, which is a part of high culture tourism. Many films are adaptations of well-known books, so some authors take the liberty of combining both forms in literary-film tourism [Stasiak 2009].

Film tourism can be broken down into [Stasiak 2009]:

- biographical tourism, which is travelling to visit biographical museums of film stars, locations in which they were born, lived and died, locations in which they worked, seeing actors' monuments and memorials, visiting actors', directors' and cinematographers' graves, participating in film festivals as well as meeting with actors, idols, etc.
- film fiction tourism, which is visiting places related to film production, film settings, participating in performances or film workshops, watching films in the natural environment, the so-called open-air cinema, travelling to film theme parks and following film heroes' routes, etc.

Film tourists are tourists whose motivation to travel was triggered by a film. Tourist destinations are exclusively related to places, locations, events and characters promoted on the cinema screen [Gjorgievski and Trpkova 2012]. It is difficult to define a specific group or create a characteristic of a film tourist. People motivated to travel by a film are also people governed by various other motives when they choose a particular tourist destination. Film tourism participants can be divided into three groups:

- film lovers – conscious cultural tourists, having sophisticated taste, preferences and a mind of their own, knowing the ropes of films and filmography, with great knowledge on this topic, travelling the most often individually rather than in a group to get to know places and sites connected to film production and having a desire to experience an adventure related to a film that they have seen.

- school trip participants – the trips are organized, related to the school curriculum and education through getting familiar with film and such aspects as culture, language, history and arts; the trips are related to set books and the participants have a very limited choice as far as the organization and schedule of the trip are concerned.
- mass film tourists – people who are not very much interested in film, but because of a particular film popularity, pushed by fashion and their friends' and family's reviews, which encourage them to go the cinema, they take into account travelling to a place connected to a film production while they are planning their holidays. Desire to travel can be considered as film-motivated, but people are also frequently influenced by such factors as fashion, willingness to impress friends – to show that they have been in a particular place or seen a famous actor, or the effect of “screen magic” – considering things seen and heard on TV or at the cinema as exceptional [Stasiak 2009].

To encourage potential tourists to visit various film production locations, it is important to promote them. Promotion in tourism is of great importance: it is a significant aspect in the tourist market. It is an element which, while the decisions on the type of services and price are being made, makes it possible to develop a strategy that a producer wants to execute to encourage customers to buy a service, product or trip. One should consider the best combination of promotional activities which will bring the greatest effect. These activities should lead to creating the image of a particular service, place, product so that they will meet customers expectations [Panasiuk 2013]. Showing the advantages of a region and tourist attractions related to a destination makes it possible to build an image of this tourist location as a fashionable place. Promotion can be addressed to various target groups both domestically and abroad, but it can be also addressed to locals and the region employees, namely the people who do not like to travel to remote places, but they look for a holiday destination [Oleksiuk 2009].

Films can offer perfect marketing and promotional opportunities because they work as virtual holiday brochures. A strong film industry also contributes to successful film tourism both domestically and region-

ally. One does not know much about the influence of film on domestic tourism. It is not always possible to estimate how much it is films that impact tourists' decisions and how much it is the other determinants¹.

Getting a promotional effect is often connected to a wider concept of city or town placement. Including a destination in a film is an ultimate placement of a tourist product. Product placement is a new phenomenon and it has been defined as scheduled introduction of products into films or television programmes, which can have a positive influence on consumers' attitudes and behaviours. Product placement increase was caused by a declining effectiveness of traditional advertising techniques. One can think that communication by means of product placement can be more effective, more targeted and more widely perceived than traditional advertising methods. Analogically to how product placement will influence a viewer's attitude to brand, films will have an impact on the destination image if this location plays a role in a film. If a destination image is to have a positive influence on tourists, it has to be shown in an outstanding way and well perceived by viewers. Local authorities are more and more convinced about the advantages of promotion through films. For some locations, such projects can be more beneficial than promotion through billboards and television spots. The effectiveness of such an undertaking depends above all on film attractiveness: the more the viewers like the film, the more eagerly they will go to a particular destination. Such a flow of information can be strengthened by characters presented in a film. One can achieve even greater benefits in the promotion of tourist destinations by combining the beauty of landscapes with acting than by showing an average advertisement already known to tourists [Żemła and Zawadzki 2014].

Film tourism is more and more often perceived as good advertisement of tourist destinations. This is why it has become an element of promotion. With time, it may happen that more people will travel because they will be encouraged by a film, and such a form of promotion will be more and more valued.

MATERIAL AND METHODS

The main objective of the research was to find out whether film tourism influenced the promotion of selected tourist destinations. Moreover, the research looked for the answers to the following questions:

- What tourist destination is chosen the most eagerly after watching films?
- What film genre is of the greatest importance to promoting a particular tourist destination?
- What film is chosen the most often as an incentive for going to a particular film tourist destination?
- What sources of information (promotion) influence the decisions on travelling to a particular film tourism destination?
- What were the respondents' motives when they were taking decisions on travelling to a particular film tourism destination?

The research was run from April to August 2018² among people who stayed in Warsaw at that time. Therefore, random sampling was applied in the study. It was done by means of the method of diagnostic survey with the use of the technique of a standardized questionnaire, which was the source of information necessary to accomplish the goal. The study covered 748 people, but after verifying the correctness of questionnaires which had been filled in, 732 respondents were qualified for the analysis.

RESULTS AND DISCUSSION

The research was done to find out whether film tourism influenced the promotion of selected tourist destinations. Respondents were asked questions concerning film, film tourism and the sources of information influencing promotion.

To make a more effective presentation of the outcomes, the research population was analysed, i.a., from the point of view of the following characteristics: gender, age and income sources.

55% of the respondents were women and 45% were men. The respondents' age was as follows: 3%

¹ www.journals.sagepub.com.

² The survey was partly done by Ms. Katarzyna Tomaszewska.

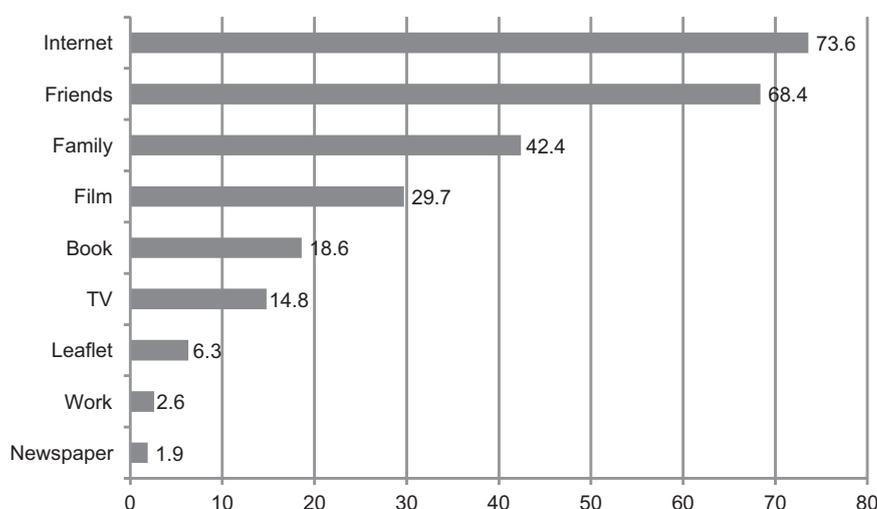
were under 18, 66% were between 18 and 25, 13% were between 26 and 35, 3% were between 36 and 45, and 15% were over 46. Asked about their level of education, the respondents indicated secondary education the most often (52%), which can reflect the fact that they were mostly young people. The fewest people declared elementary education (4%) because a part of the respondents were under 18, and NVQ (4%). Fewer than a half of the respondents had university education (40%). As far as monthly income per person in a household is concerned, nearly ¾ of the respondents declared that it was over PLN 1,001, 24% indicated that it was between PLN 500 and PLN 1,000, while 4% said it was below PLN 500.

Asked if they had ever heard of or tried film tourism, more than a half of the respondents (58.1%) answered that they had not heard of this term, which meant they had not used this form of tourism. This may be caused by, i.a., a lack of information on the development or opportunity of travelling to film production locations. While visiting a particular place, many people could have been unaware of the fact that they were visiting a place where a particular film was set. However, 41.9% of the respondents knew the term “film tourism” and they had happened to visit such

a place, which indicates that they were aware of the fact that such a phenomenon existed. Among those who declared that they had tried film tourism at least once in their life (41.9%), there were more people between 36 and 45 years of age and they accounted for ¾ of the respondents. People under 25 years of age were the smallest group.

To find the determinants of the decision to travel to a film production site, the respondents were asked what sources of information influenced their choice of destination. The detailed data are presented in Figure 1.

The Internet appeared to be of the greatest importance for the respondents as regards the source of information (promotion) contributing to a desire to travel to a film tourism destination. While looking for a travel destination, many tourists seek information on the Internet first because they want to know the opinions on a particular place and whether it is worth visiting in general. This answer was indicated by nearly ¾ of the respondents. That is why the Internet is an appropriate medium where a particular location should be promoted. Friends were slightly less important as regards the decision to travel. This answer was selected by 68.4% of the respondents.



A respondent was allowed to indicate more than one answer.

Fig. 1. The influence of sources of information (promotion) on the decisions on travelling to a particular film tourism destination (%)

Source: The author’s own research outcomes.

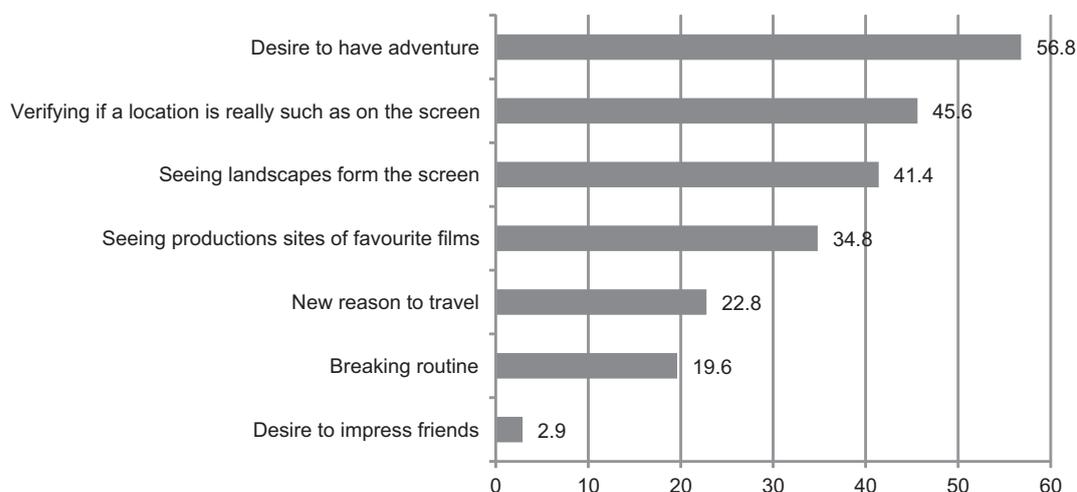
Family was also indicated as a significant determinant of this decision. It suggests that the Internet has the greatest impact on people at present. The responses taken into account less frequently included film, book and TV – these information carriers were considered by the respondents as less significant to their decision. Leaflet, newspaper and work had the least value for the respondents. At present electronic carriers are more significant and there is a greater chance that they will convey the message than in case of paper ones. That is why a leaflet or information in a newspaper are not so important. A part of the respondents also added that their dreams, interests and location sightseeing values influenced their decision to travel. Moreover, the majority of the respondents (90%) thought that film tourism promotion was not sufficient.

Another aspect of the survey covered finding out what motivated the respondents to decide to travel to a particular tourist destination and what films and tourist destinations the respondents considered to be attractive as regards film tourism. This is presented in Figure 2.

The motives of journeys are one of the important determinants of choosing the destination. These are the desire to explore, impress and experience something new that make people more interested in trav-

elling. Internal and external motivations push tourists towards new locations and make them look for unusual experiences. Asked what motivated them to choose a destination connected to a film production site, the respondents the most frequently indicated the desire to experience an adventure. Slightly less frequently the respondents answered that they wanted to verify if a location was really such as on the screen and to see the landscapes from the screen. The smallest number of respondents answered that they chose a particular destination to impress their friends.

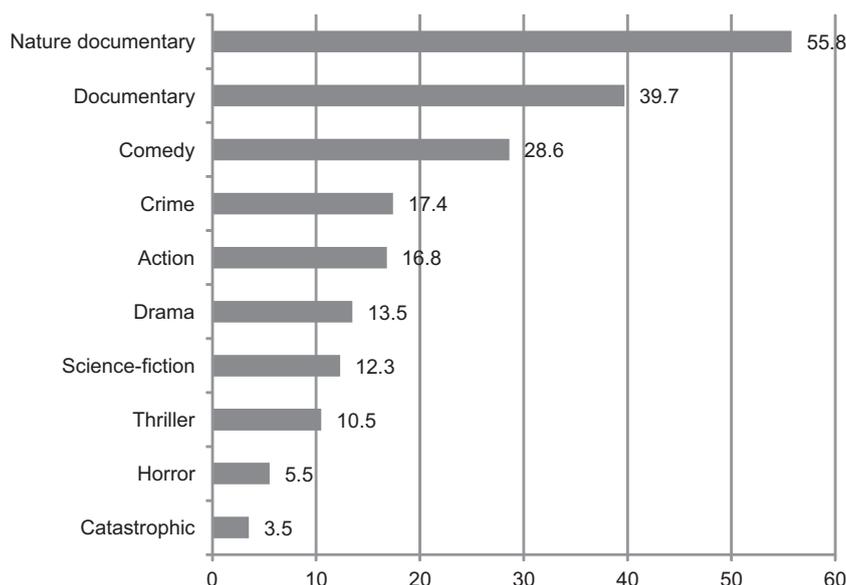
A film genre is of great importance as regards showing an interesting destination in a film. In some films, one can see fictional locations; in other – beautiful natural landscapes or historical places. Not each film genre presents what is thought to be attractive as far as film tourism is concerned (Fig. 3). The research showed that nature documentaries encouraged people to travel to film production locations the most. It is the desire to see the landscape, scenery in which a film was set, locations with attractive nature that made people travel. Other genres also selected by the respondents were documentaries and comedies. Films which were set in reality are very popular, that is why documentaries are top-rated. Fictional places are often located in the real world, which gives tourists a possibility to see them live. Genres such as action film, drama, science



A respondent was allowed to indicate more than one answer.

Fig. 2. Motives of travelling to a particular film tourism destination (%)

Source: The author's own research outcomes.



A respondent was allowed to indicate more than one answer.

Fig. 3. Film genres encouraging people to travel (%)

Source: The author's own research outcomes.

fiction film were not frequently selected because in those films, the location of a place is usually not the most important aspect. A film is often made only in a set which is especially prepared for this particular film. The genres that were the least frequently selected included thriller, horror and catastrophic films. This can be caused by the fact that fear does not necessarily encourage people to travel to a particular destination. The survey also checked what film genres were preferred by women and men. The result is not surprising: $\frac{3}{4}$ of women chose nature documentaries, documentaries and comedies. Men preferred science fiction or horror films more often than women.

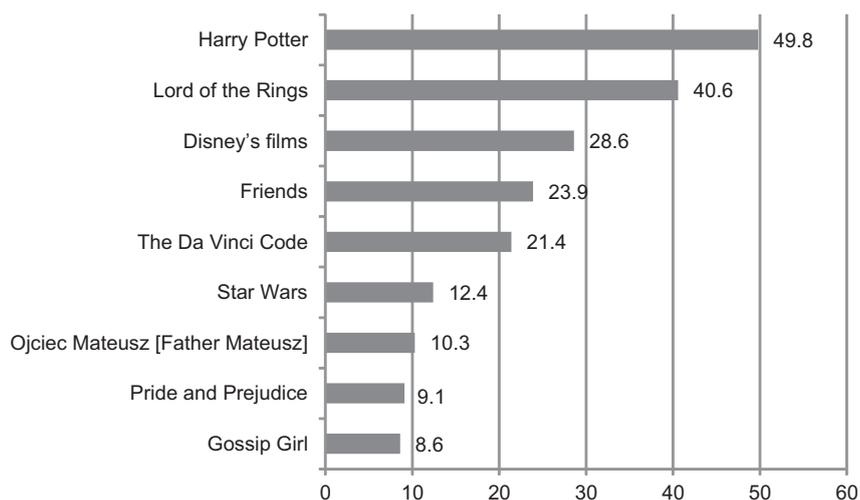
There are many popular films which have already encouraged or will encourage tourists to see their production sites. The respondents had a choice of several examples of films belonging to those perceived as the most attractive ones related to film tourism. The detailed data are presented in Figure 4.

“Harry Potter” and “Lord of the Rings” were the most often selected by the respondents as the films which encouraged them to travel to their production locations. These films are also mentioned in publications on film tourism. The UK and New Zealand

profited from the popularity of these films. Disney's films were also valued. Maybe because images presented in a cartoon sometimes look similar to real locations or maybe due to the popularity of Disneyland. The series “Friends” was next. It gained numerous fans all over the world and the threads of the film plot were an inspiration for many other films and series. “The Da Vinci Code” was also selected by a considerable number of people: it was popular among film tourists due to interesting locations in Italy and France. The other films, which gained less attention among respondents included “Star Wars”, “Ojciec Mateusz” [“Father Mateusz”], “Pride and Prejudice” and “Gossip Girl”.

In the survey, there were several examples of film tourist destinations selected according to film tourism popularity. The listed countries were the background for numerous film productions and the stories presented in films were set, i.a., in these locations. The data on this aspect are presented in Figure 5.

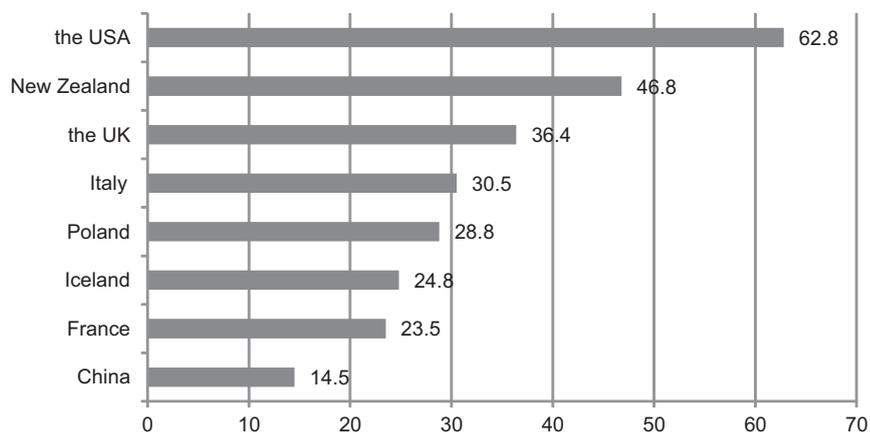
The USA was the most often selected country. The USA is a location where numerous worldwide popular films were produced. American films are the best known and the most frequently watched ones,



A respondent was allowed to indicate more than one answer.

Fig. 4. Films chosen by film tourists (%)

Source: The author's own research outcomes.



A respondent was allowed to indicate more than one answer.

Fig. 5. Film tourism destinations (%)

Source: The author's own research outcomes.

especially in Poland. New Zealand was another country attractive as far as film tourism is concerned. It was probably due to the film “Lord of the Rings”. The UK was also popular thanks to the famous film “Harry Potter”. Other frequently, but to a smaller extent, chosen countries included Italy, Poland, Iceland and France. The least frequently, the respondents selected China as a country which they would like to visit.

CONCLUSIONS

The results of the research referring to film tourism in the promotion of tourist destinations indicate that it is a phenomenon that should further be promoted. It is because fewer than a half of the respondents (41.9%) had heard of it. This can be influenced by new film productions and the fact that people are more and more interested in new forms of tourism. The popularity

of film as an advertisement of tourist destinations is increasing and it is becoming a recognizable promotion tool. Film productions can bring huge benefits to a country in which they are made.

The research made it possible to find out whether film tourism has an influence on the selection of tourist destinations. It is not significant because this form of tourism has been still developing. The USA appeared to be the most eagerly chosen destination, and the target group which is the most influenced by film covers people over 35 years old. Nature documentaries are the most significant in promotion and “Harry Potter” is the film which was the most frequently selected as the reason to travel. The desire to experience an adventure was the most frequently chosen tourists’ motivation.

However, one should bear in mind that the study makes it possible to show only the behaviours of consumers who are part of the widely understood film tourism, which means that it should not be treated as research representative for the whole population of Polish consumers.

It should be also pointed out that film tourism can be significant to the local and regional social and economic development of selected areas of tourist reception, being at the same time a new contribution to the research on the developing film tourism field, including in Poland [Tucki 2016].

The issues presented led to the conclusion that film tourism can be included in promotion, but it needs promulgating to a greater extent.

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TURYSTYKA FILMOWA W PROMOCJI WYBRANYCH DESTYNACJI TURYSTYCZNYCH

STRESZCZENIE

Turystyka filmowa jest zjawiskiem dość mało znanym, lecz rozwijającym się w miarę powstawania nowych produkcji filmowych i zainteresowania ludzi tą dziedziną. Film jest w pewnym stopniu nowym narzędziem promocji, wykorzystującym nakręcony obraz do pokazania w sposób zamierzony i dostosowany do widowni miejsca i historii, które później mogą zachęcić ludzi do wyjazdu do danej miejsca.

Celem artykułu było określenie, czy turystyka filmowa wpływa na promocję wybranych destynacji turystycznych. Posłużono się metodą sondażu diagnostycznego z wykorzystaniem techniki ankiety według standaryzowanego kwestionariusza. Wyniki przeprowadzonych badań odnoszące się do turystyki filmowej w promocji destynacji turystycznych wskazują na to, iż jest to zjawisko, które należy jeszcze bardziej promować, gdyż niespełna 50% badanych spotkało się z pojęciem turystyki filmowej.

Słowa kluczowe: promocja, turystyka filmowa, destynacja turystyczna

IMPACT OF NEW MEMBER STATES ACCESSION ON FOOD SAFETY AND OBESITY IN THE EUROPEAN UNION

Piotr Bórawski¹  , Aneta Bełdycka-Bórawska¹ ,
Mariola Grzybowska-Brzezińska¹ , Jayson K. Harper² 

¹University of Warmia and Mazury

²The Pennsylvania State University

ABSTRACT

The objective of this paper is to present food safety in the EU and obesity among inhabitants of the Member States countries. The Global Food Security Index (GFSI) was analyzed for the period from 2012 till 2016 using descriptive, tabular and graphical methods. UN-FAO data was the source of information on the GFSI. The concept of the GFSI is described and then used to explain changes in national food security and obesity over time. The GFSI index in 2016 was the highest in Ireland (84.3) and Netherlands (82.6). The lowest GFSI Index in 2016 was found in Bulgaria (60.6), Romania (65.6), and Slovakia (67.7). The results indicate that the largest increase in the GFSI during this period were observed in the Great Britain (+3.1), Ireland (+2.4), and Germany (+1.4). The authors also analysed obesity resulting from excessive consumption of food in developing and developed countries. The research shows that the highest obesity rates are in the Great Britain (28.1%), the Czech Republic (26.8%), Slovakia (25.7%), and Ireland (25.6%).

Key words: food safety, obesity, EU countries

INTRODUCTION

Recent developments in the food system in Europe have focused primarily on food quality attributes. Increasing wealth and consumption awareness by customers have led to food purchase decisions based more on quality rather than quantity criteria. Attention has focused on how food quality fulfills consumer demand and the impacts the quality of societal well-being. Food quality attributes have a large impact on the choice of production and technology processes at the enterprise level.

Cooperation between farmers, processors, and traders is very important because a problem in one

sector of the food system (for example, poor production at the farm level) can disrupt the entire supply chain. At the farm level, food quality is determined by the physical and chemical characteristics of individual food items. Overall, food quality requires recognition of consumer needs and preferences at every stage of the food chain [Cyrek et al. 2016]. Henson and Caswell [1999] suggest that development of food policy should include customers, food manufacturers, food retailers, farmers, government, and taxpayers. Policymakers need to balance the alternative demands of these groups, including the need for trade policy, food security, and food safety and nutrition labeling regulations. Another stimulus has been the

Piotr Bórawski  <https://orcid.org/0000-0002-6616-7140>; Aneta Bełdycka-Bórawska  <https://orcid.org/0000-0002-1398-0082>;
Mariola Grzybowska-Brzezińska  <https://orcid.org/0000-0002-6571-1140>; Jayson K. Harper  <https://orcid.org/0000-0002-0681-9362>

 pboraw@uwm.edu.pl

move to reduce food loss and waste. It is estimated that 89 million t of food is wasted in the EU annually. Approximately 9 million t of food is destroyed each year in Poland, which is fifth in the EU behind the Great Britain, Germany, France, and the Netherlands [FAO 2011].

The phenomenon of food waste is dominated by consumption trends and changing consumer behavior. These changes have also contributed to the generation of excessive production waste and food losses. Irrational consumption leads to negative social consequences, including the development of such diseases as diabetes, heart disease, allergies, obesity, and depression. Growing criticism of unbridled consumption has resulted an intensive campaign of education in favor of healthier lifestyles, supported by the establishment of various laws (primarily by the World Health Organization and the European Union). A significant role is also played by environmental and ethical arguments. Mass production of consumer goods and their constant improvement, coupled with intensified marketing, further diminishes market transparency. Consumers are becoming more and more lost in the excess of goods and their prices. The information asymmetry in the market increases in favor of the seller [Mróz 2013].

Rapid technological and organizational progress in recent decades has significantly increased technical and economic efficiency and the effectiveness of production and distribution processes. These results led to the reduction of the complexity and the energy consumption of food production. More goods are produced not only more quickly, but also more cheaply. This phenomenon is undoubtedly economically and socially beneficial. Powerful arguments can also be made on the side of rational consumption of non-renewable natural resources. As a consequence, the growing problem of food safety in the context of health has appeared. The problem of food safety is also impacted by national policies relating to the sustainability of food production and consumption. Bearing in mind the changes over time in the economics of food production and manufacture, and in food safety and security, this paper investigates the role that the accession of new members to the EU since 2004 has had on the GFSI.

LITERATURE REVIEW

The development of the food sector is often thought to be an important step in achieving food self-sufficiency for a country. The concept of food self-sufficiency is defined by the FAO [1999] as a country's ability to "satisfy its food needs from its own domestic production". However, Clapp [2017] claims that "most net food exporting countries are not self-sufficient". Self-sufficiency is often "focused on the supply, or availability component of food security, and is concerned with ensuring that the country has the capacity to produce food in sufficient quantities to meet its domestic needs". The concept "does not distinguish whether that food is imported from abroad or grown domestically" [Clapp 2014].

Another issue for the food sector is the potential public health problem resulting from food borne illnesses. There are at least two approaches to studying the impacts of food safety scares. The first evaluates the impact of food safety on market demand or price. Pozo and Schroeder [2016], for example, measured the cost of meat and poultry recalls and point out that they are a major concern that can cause significant economic losses for food production, processing, and marketing firms. Recalls can also trigger a decline in consumer confidence, thereby reducing future product demand. The second approach tests if hypothetical food safety standards have an impact on consumer behavior. Nowadays consumers pay much more attention to how their food is produced, including the fast growing organic sector that uses practices with reduced environmental impacts [Li et al. 2017].

Another important problem is food security which is linked with various factors such as climate change, grazer performance, technology, management, and irrigation [Yang and Nie 2016]. Food security is a difficult balancing act in the context of a sustainable agro-food system. This problem is exacerbated by climate change and greenhouse gas emissions and the preservation of key resources like soil and water [Mylon et al. 2018]. Environmental degradation is both directly and indirectly linked to the overall size of consumption. Increased production has also resulted in increased demand for natural resources and accumulation of additional post-consumer waste streams.

A survey conducted by Firlej [2010] proved that domestic enterprises consider the impact of cooperation and competition with other developed countries. Among other factors influencing the competitiveness of food industry sector are the environment, technical infrastructure, and various human capital characteristics. Market conditions directly affect the profitability of food enterprises. The food industry cannot function alone without other elements of the marketing chain including customers and consumption behavior. An important factor is dedicated to global turnover including export of food products [Stefko 2013].

RESEARCH METHODS

The primary objectives of this research are to: (1) evaluate changes in the food security index; and (2) link these results to the number of obese people in the EU. The Global Food Security Index (GFSI) developed by UN-FAO is used to evaluate food security in the EU. The GFSI includes the following criteria: price affordability, food availability, food quality and safety, food consumption as a share of household expenditure, GDP per capita, food loss, and diet diversification. Changes in the overall GFSI index during the period from 2012–2016 for EU countries are presented and changes in components of GFSI are investigated further to determine the causes of fluctuation in the index.

FOOD SAFETY AND SECURITY IN EU COUNTRIES

Food safety is a critical issue both for consumers and the food industry. The UN-FAO's definition of food safety is "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" [UN-FAO 1996]. Critical food safety issues can arise at any time during the preparation, cooking, buying, and consumption process. An important tool to protect consumer is the Hazard Analysis Critical Control Points (HACCP) program, a systematic approach to food safety that was started in the early 1960s and is now codified in the ISO 22000 family of food safety management

standards. As Schillhorn van Venn [2005] points out, HACCP helps in the introduction of food safety management protocols and it can be based on local skills and concepts rather than the introduction a western model. Understanding the process of critical control points is complicated because cross border supply chains are organized in different trade environments, each with their own regulations, logistic networks, and technologies. Good Agricultural Practices (GAP) and Good Handling Practices (GHP) programs also help maintain safe food by using voluntary audits to make sure that fruits and vegetables are grown, harvested, shipped, and stored to minimize the risk of contamination [Rahmat et al. 2016].

Food safety considerations are particularly important when considering market access requirements and exports. High income countries comply with food safety standards because they support food security goals [Unnevehr 2015]. Today's consumers demand high quality products in the right place and at the proper time. The demand for healthy food is growing with income levels, urbanization, and consumer awareness. Consumers are concerned because the incremental exposure to illness caused by exposure to food contamination every day. The WHO [2014] reports that more than 90% of human exposure is due to food, particularly meat and dairy products, fish, and shellfish. Demand for quality food is increasing and is evidenced by the growth in health food and organic food markets [Winter 2003]. Supporting food safety requires investment at various levels, including human resources, agricultural infrastructure, water resources, and natural resources with an aim towards decreasing poverty in rural areas [Rosegrant and Cline 2003].

Another important issue for food safety is packaging which is continuously evolving in response to the growing challenges from modern society. Major challenges include legislation, global markets, longer shelf life, convenience, safer and healthier food, and reduction of food waste [Realini and Marcos 2014]. Packaging is designed to protect products from the external environment, inform the consumer, and accommodate consumer life style choices. Packaging is an important food quality control designed to better protect the consumer against food-borne illness and to maximize the efficiency of food industries [Ghaani et al. 2016].

Food packaging is undergoing innovations and must meet the increasing requirements of target consumers [Vanderroost et al. 2014].

Although global food production is currently sufficient to feed people, many people still suffer from hunger. This is because the available food is not well distributed even though agricultural yields are increasing. Increasing yields can also mean disruption of natural processes because of the use of artificial fertilizers and pesticides. That is why agriculture intensification that is designed to feed the most people and issues relating to biodiversity represent major future challenges [Tschamtkke et al. 2012]. About 1.2 billion people in the developing world are poor, spending a dollar or less per day on food and other basic needs. Most poor people live in the rural areas and directly depend on subsistence agriculture to survive. According to Pinstup-Andersen and Pandya-Lorch [2001] about 800 million people (one-sixth of the developing world's population) do not have access to sufficient food to lead healthy, productive lives. To help fight hunger, local food programs appear whose aim is to improve the nutrition of local society and local environments, developing greater sense of community ownership, and supporting sustainable development. These programs are based on local foods, community enterprises, health and education, and economic activity [Kirwan et al. 2013].

The development of national food industries are linked with food security. The GFSI has been published since 2012 and uses a set of indices of food affordability, availability, quality, safety, food consumption as a share of household expenditures, per capita GDP, food loss, and diet diversification to measure food security across 113 countries. Changes in the GFSI for EU countries during the period 2012-2016 are presented in Table 1. In the EU the highest values for the global food security index in 2016 were in Ireland (84.3), the Netherlands (82.6), and Germany and France (82.5). The lowest values for the GFSI were observed in Bulgaria (60.6), Romania (65.6), and Slovakia (67.7). The largest increase in the GFSI during the 2012–2016 period was observed in the Great Britain (+3.1%), Ireland (+2.2), and Germany (+1.3). The largest decrease in the GFSI during these years was in Greece (–3.2%), Hungary (–2.6%), and Denmark (–1.1%).

Changes in the various components of the Global Food Security Index for members of the EU during the period from 2012–2016 are shown in Table 2. Price affordability in 2016 was highest in Ireland (82.4), Austria (81.9), and Germany (81.7). The price affordability improved most during this period in Bulgaria (4.0%), Poland (1.1%), and Romania (0.5%). Food price affordability did not change in Austria and Denmark. Food affordability decreased in the period from 2012–2016 in Greece (–8.5%), Portugal (–0.9%), and Finland (–0.6%). The price affordability was analyzed by Kraciuk [2017]. He found that decreasing price affordability in the years 2012–2016 indicated problems on demand side.

The food availability increased the most during this period in the United Kingdom (9.4%), Ireland (6.4%), and Portugal (4.3%). The highest levels of food availability in 2016 were seen in Ireland (85.4), Germany (83.8), and France (82.7). Food availability decreased the most in Hungary (–7.3%), Bulgaria (–3.6%), and France (–2.5%). The highest food quality and safety in 2016 were observed in Portugal (89.7), France (88.7), and the Netherlands (86.1). The countries with the largest improvement in food quality and safety were Germany (1.9%), Finland (1.7%), and Slovakia (0.9%). The countries who experienced the largest decreases in food quality and safety were Hungary (–2.9%), Romania (–2.0%), and Denmark (–1.8%).

The food consumption as a share of household expenditure increased most in Portugal (13.9%), the Czech Republic (11.3%) and Hungary (9.6%). It did not change in Belgium, Greece, or Italy. The highest food consumption as a share of household expenditure in 2016 was observed in Romania (37.5%), Bulgaria (18.7%), Poland and Portugal (18.0%). The food consumption as a share of household expenditure decreased most in Poland (–6.7%), the United Kingdom (–2.3%), and Denmark (–0.9%) and increased the most in Portugal (13.9%), the Czech Republic (11.3%), and Hungary (9.6%). Per capita GDP increased most during the period 2012-2016 in Slovakia and Romania (17%) and Ireland (15.3%). It decreased the most in Greece (–3.2%). The highest GDP per capita at PPP (USD) in 2016 was in Ireland (USD 51,800), the Netherlands (USD 49,190), and Austria (USD 47,170).

Table 1. Global food security index in EU member countries in 2012–2016

Country	Global ranking	2012	2013	2014	2015	2016	Five-year change (%)
		points					
Austria	16	78.9	79.2	79.8	78.8	79.3	+0.4
Belgium	21	77.9	77.6	76.9	76.5	77.4	-0.5
Bulgaria	50	60.5	60.3	59.3	59.5	60.6	+0.1
Cyprus	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Croatia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Czech Republic	25	73.0	74.0	73.3	72.6	73.9	+0.9
Denmark	14	81.1	80.5	80.7	79.2	80.0	-1.0
Estonia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Finland	17	79.6	79.4	78.4	77.2	78.9	-0.7
France	6	83.5	83.0	81.5	81.6	82.5	-1.0
Germany	6	81.2	80.9	81.5	81.6	82.5	+1.4
Greece	31	74.7	71.5	72.3	70.7	71.5	-3.3
Hungary	34	71.9	71.6	69.6	68.5	69.3	-2.6
Ireland	2	82.1	81.4	81.8	82.3	84.3	+1.5
Italy	22	75.3	74.7	75.8	75.0	75.9	+0.6
Latvia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Lithuania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	4	82.9	82.4	82.8	82.2	82.6	-0.2
Poland	29	72.6	71.6	71.7	72.1	72.4	-0.2
Portugal	14	78.8	78.4	79.1	78.7	80.0	+1.2
Romania	42	65.2	65.2	65.8	64.8	65.6	+0.3
Slovakia	40	68.1	67.6	67.0	67.0	67.7	-0.4
Slovenia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Spain	19	78.3	77.7	78.4	76.9	77.7	-0.6
Sweden	10	80.7	80.1	80.3	80.0	81.3	+0.6
United Kingdom	8	78.8	79.0	79.4	79.3	81.9	+3.1

Source: Global Food Security Index. Reports of 2012, 2013, 2014, 2015 and 2016.

Food loss is one of the biggest challenges to food security worldwide. The United Nations announced a strategy under the Sustainable Development Goals (SDG) agenda to reduce food waste reduction by 2030 [Sheahan and Barrett 2017]. During the period from

2012 to 2016, the countries that reduced food loss the most were Slovakia, the United Kingdom, and Denmark, while Italy, Sweden, and the Netherlands experienced the largest increases in food waste. However, the highest percentage of food loss in 2016 was

Table 2. Changes in the Global Food Security Index components in EU countries in the years 2012–2016 (%)

Country	Price affordability	Food availability	Food quality and safety	Food consumption as a share of household expenditure	GDP per capita	Food loss	Diet diversification
Austria	0.0	0.93	0.49	1.0	7.81	10.0	-1.5
Belgium	-0.2	-1.49	0.0	0.0	5.91	13.4	-3.9
Bulgaria	4.04	-3.6	-0.34	2.7	12.7	-8.33	0.0
Czech Republic	-0.4	3.86	-0.57	11.3	12.9	-8.33	1.4
Denmark	0.0	-2.26	-1.77	-0.9	7.02	30.0	-1.4
Finland	-0.6	-1.95	1.65	5.8	0.21	-5.0	0.0
France	-0.3	-2.48	0.0	3.9	6.5	-6.5	-1.4
Germany	0.1	3.20	1.88	1.0	9.3	0.0	1.5
Greece	-8.9	-1.31	-1.03	0.0	-3.2	-6.7	2.8
Hungary	-0.26	-7.3	-2.89	9.6	14.4	0.0	0.0
Ireland	0.2	6.4	-1.15	8.2	15.3	-16.1	1.4
Italy	-0.4	2.76	-0.72	0.0	1.87	-48.8	-5.4
Netherlands	-1.1	-0.24	-0.23	4.5	5.84	-14.8	-1.5
Poland	1.07	-1.72	0.54	-6.7	15.5	27.3	3.0
Portugal	-0.9	4.31	0.45	13.9	7.9	2.7	1.7
Romania	0.45	1.5	-1.95	0.0	17.4	0.0	2.9
Slovakia	0.27	-2.19	0.75	2.3	17.4	42.1	-1.4
Spain	-0.3	-1.21	-0.58	4.0	7.36	0.0	1.6
Sweden	0.1	1.78	0.35	1.6	8.0	-20.7	-1.8
UK	0.4	9.40	-1.22	-2.3	11.9	33.3	-6.6

Source: Own study based on Global Food Security Index 2016.

found in Bulgaria (9.2%), Greece (4.6%), and Poland (3.8%). The highest diet diversification in 2016 has been found in 2016 in Spain (75), Austria (74), and Holland (73). The largest increases in diet diversification over the 2012–2016 period occurred in Poland (3.0%), Romania (2.9%), and Greece (2.8%).

CONCLUSIONS AND IMPLICATIONS FOR POLICY

The GFSI did not change much for the overall EU during the period from 2012–2016. Price afford-

ability improved in many countries, improving during 2012–2016 in Bulgaria (4.0%), Poland (1.1%), and Romania (0.5%). Moreover, food availability increased the most during this period in the United Kingdom (9.4%), Ireland (6.4%), and Portugal (4.3%). In addition, the food consumption as a share of household expenditure increased most during this period in Portugal (13.9%), the Czech Republic (11.3%), and Hungary (9.6%).

One of the problems of developed countries in the EU is obesity of their inhabitants. Countries with

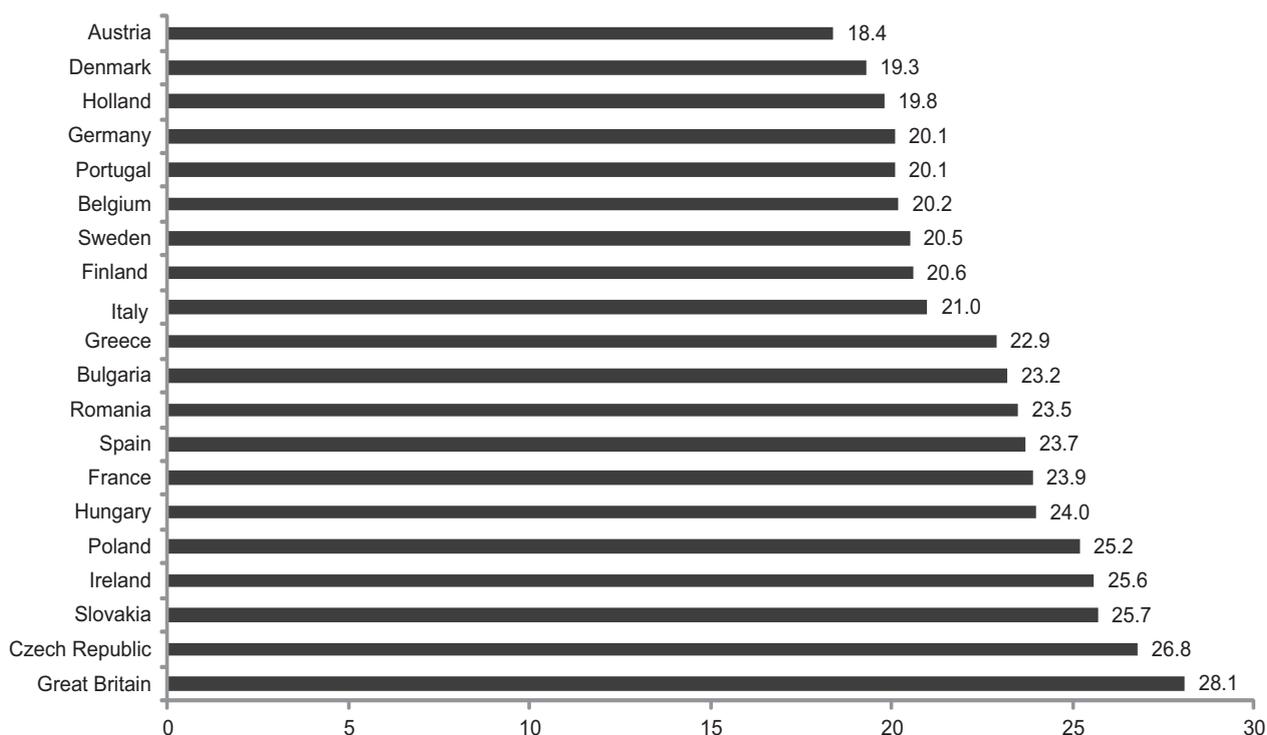


Fig. Obesity in people over 20 years old in the European Union in 2016 (%)

Source: Own study based on Global Food Security Index 2016.

the highest obesity rates in 2016 are the Great Britain (28.1%), the Czech Republic (26.8%), Slovakia (25.7%), and Ireland (25.6%). The lowest obesity rates are in Austria (18.4%), Denmark (19.3%) and the Netherlands (19.8%) – the figure.

Food safety in the new member states of EU-12 which have joined the EU since 2004 is lower compared to member states of the EU-15. This will continue to be a problem for income redistribution programs that support proper food safety. The quality of products should be improved. This can be achieved by increasing international awareness about food safety and quality, especially for niche products. This requires investments in quarantine infrastructure and laboratories to monitor the safety of food products. Adopting ISO, HACCAP, and GHP and in conjunction with GAP for pest management, manure handling, and phytosanitation would revolutionize food quality system and food safety management systems worldwide [Rahmat et al. 2016]. Food security requires investment in research and water and transport infrastructure. Innovations in

agricultural production practices and crop breeding can enhance global food security.

Encouraging developed and developing countries to be more active participants in international bodies such as the WTO and other trade organization is important. This will help promote consumption of healthy food and establishment of consumer protection rules. It is also a way to improve policies and consumer and producer awareness. Discussions at the WTO need to be broadened to take account of the important role that voluntary standards play in influencing global trade patterns in food and agricultural markets [Shepherd and Wilson 2013]. Most discussion focuses on mandatory standards, but voluntary standards also matter.

Promotion of healthy life styles to decrease obesity should be national priorities. Health standards, improved food processing technologies, and consumer demand for safety standards should be addressed worldwide [Rahmat et al. 2016]. It is not only necessary to make more food available, but it is also important to make high quality food accessible. This can be

accomplished through education, fortifying foods with vitamins and minerals, and encouraging a diversified diet and healthier choices [Pinstrup-Andersen and Pandya-Lorch 2001].

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WPŁYW AKCESJI NOWYCH KRAJÓW CZŁONKOWSKICH NA BEZPIECZEŃSTWO ŻYWNOŚCI I OTYŁOŚĆ W UNII EUROPEJSKIEJ

STRESZCZENIE

Celem pracy było przedstawienie bezpieczeństwa żywności w krajach UE oraz problem otyłości wśród mieszkańców krajów członkowskich. Globalny wskaźnik bezpieczeństwa żywnościowego (ang. *Global Food Security* – GFSI) został przeanalizowany w latach 2012–2016. Do analizy wyników autorzy artykułu wykorzystali metody tabelaryczne, graficzne i opisowe. Źródłem informacji były dane FAO. Na początku zaprezentowano GFSI, a później jego zmiany i kształtowanie się otyłości wśród ludności UE. Globalny wskaźnik bezpieczeństwa żywnościowego w 2016 roku był najwyższy w Irlandii (84,3) i Holandii (82,6), a najniższy odnotowano w Bułgarii (60,6), Rumunii (65,6) i na Słowacji (67,7). Wyniki wskazują, że największy wzrost wskaźnika GFSI w tym okresie zaobserwowano w Wielkiej Brytanii (+3,1), Irlandii (+2,4) i Niemczech (+1,4). Autorzy artykułu analizowali również otyłość, która jest skutkiem nadmiernej konsumpcji żywności w krajach rozwiniętych i rozwijających się. W analizach wykazano, że najwyższe wskaźniki otyłości występują w Wielkiej Brytanii (28,1%), Czechach (26,8%), na Słowacji (25,7%) i w Irlandii (25,6%).

Słowa kluczowe: bezpieczeństwo żywności, otyłość, kraje UE

THE IMPORTANCE OF TRANSPORT INFRASTRUCTURE INVESTMENTS IN REGIONAL DEVELOPMENT OF THE NORTE REGION IN PORTUGAL AND THE MASOVIAN VOIVODSHIP IN POLAND

Marcin Chciałowski  

Warsaw University of Life Sciences – SGGW

ABSTRACT

The aim of the paper was to compare the directions of investments in communication and transport infrastructure of the Norte Region in Portugal and the Masovian Voivodship in Poland. When analyzing the saturation of the infrastructure, particular attention has been paid to the investment aspect, since this factor has a major impact on the development of these regions. The conducted research has shown significant differences in the investment process itself. The Masovian Voivodship strongly diversifies the transport infrastructure investments on various modes of transport. In turn, in the Norte region one can observe a strong transport orientation geared towards an extensive network of expressways and a large access to local airports. The location of transport investments so understood in particular modes of transport is related to the different conditions of location of both regions.

Key words: transport infrastructure, infrastructure investments, Masovian Voivodship (Poland), Norte Region (Portugal)

INTRODUCTION

A contribution to reflect on infrastructure and investment activities in Poland and Portugal has been a report published by the World Economic Forum presenting indicators of competitiveness in particular fields. Both countries reached a very similar ranking position: Poland – 39th, Portugal – 42nd. Despite the closeness of the positions, the report components for both countries are slightly different [World Economic Forum 2018]. Looking at the individual indicators in detail, a number of historical analogies can be noticed between the countries, in particular between the re-

gions, resulting from the differences which existed at the moment of the accession to the European Union. For the analysis were chosen the Masovian Voivodship, located in central Poland, and the Norte Region, located in northern Portugal. Both regions are placed on NUTS 2 level. In the Norte Region, gross domestic product (GDP), measured in purchasing power parities in 2018 has reached a lower value of EUR 54.5 billion, while in the Masovian Voivodship the indicator reached the value of EUR 94.5 billion [Eurostat 2018a]. On the other hand, gross domestic product per capita (GDP per capita) in current prices was respectively EUR 17,757.14 for the Masovian Voivodship

Marcin Chciałowski  <https://orcid.org/0000-0002-0194-1748>

 marcin_chcialowski@sggw.pl

and EUR 15,112.14 for the Norte Region. A further comparative analysis of the two regions will be conducted taking into account the population and the land area [Eurostat 2018b].

DATA AND METHODS

When analysing the investment activity of local government units an overview of the latest literature was made as well as a research of the legislative acts relating to the functioning of the local authorities and the infrastructure of transport. The statistical data of the Central Statistical Office (GUS) and Eurostat on the level of development of road, railway and airport infrastructure have been used. On the other hand, infrastructure for inland navigation as being of marginal importance for the development of the two regions has been omitted as well maritime sector infrastructure, because of the lack of comparability of these regions.

In the paper was used a monographic method, which uses information in qualitative descriptive form. In order to compare the two regions, was used a comparative method, which depends on analysing the characteristics of the study's subjects and the phenomena, with a view to establishing similarities and differences in the field of transport and communication infrastructure. In the context of empirical research, an analysis and evaluation of the investment activity in the Masovian Voivodship and the Portuguese Norte Region was presented.

THEORETICAL APPROACH TO THE LOCAL GOVERNMENT INVESTMENTS

In order to formulate the concept of infrastructure investment, it is best to look into legislative acts. The Accounting Act defines investments as assets acquired in order to achieve economic benefits arising from an increase in value, interest or dividends, i.e. financial assets, real estate, or intangible assets, which are not used by their owner, but held for profit [Accounting Act of 1994]. This means that an investment must be understood as a project aimed to achieving benefits after a certain period of time. It should be remembered, however, that in the case of local government

investments, the term benefit is completely different importance than in the case of private investment. The purpose of local government investment is not a monetary gain, but rather other categories of profit such as: infrastructure improvement, unemployment decline, better education or improvement of social conditions. Because of its financial specification, it is difficult to demonstrate the economic results of such an investment, in particular profitability. However, this does not relieve the local government authorities from effective spending public funds, but significantly impedes control [Misterec 2008].

According to one of the simplest definitions of the notion of investment in academic literature, it is any cash placement in tangible and intangible projects that will provide certain benefits comparable to the objective. A certain act of abandoning current consumption and allocation of free resources for the realization of the tasks that will benefit the future can be considered an investment. This is the most general description of the notion of investment, matching both private and public sector of investments. The main features of an investment are:

- Use of the current consumption for future potential benefits.
- The time necessary to implement the investment, which means that an investor must wait for the benefits of his investment.
- Element of risk, which means that the benefits may not occur or even an investment may bring losses.

Together with the definition of investment, two important aspects are often addressed – the inputs and the benefits. Inputs are normally understood as expenditures concentrated in a fairly short period of time, usually at the beginning of an investment, thanks to which making an investment is possible. Benefits are the results that have been achieved through implementation of the investment task. They can have measurable or, more often in the case of local government investments, non-measurable values [Czampas 2013].

Infrastructure investments are the most common group of investments in the Polish Government. Infrastructure is a collection of equipment and institutions necessary for functioning of the economy and society [Sierak and Górnica 2011]. This means all the devices,

entities and investments designed to provide adequate living conditions for the population, and the opportunities for developing the economy in a given area [Sierak and Górnaiak 2011]. They can be divided into social infrastructure investments, covering: schools, hospitals, libraries, local health centres, and investments in technical infrastructure, including: roads, sewers, water pipelines [Sierak 2010].

CHARACTERISTICS OF THE EXAMINED REGIONS

The investment underdevelopment was an immense problem for Polish local governments, which severely influenced lowering of competitiveness against the Western European regions. The Masovian Voivodeship features a complex transport system, which results from its location in the heart of Poland as well as in the centre of Europe. According to the strategy of Masovian Voivodeship until 2030, the transport system should be considered as a whole, covering not only infrastructure, but also the way it is used. Transforming the quantitative system into more efficient qualitative system allows for better use of manufacturing factors and more efficient disposal of existing resources. The transport infrastructure of the Masovian voivodship includes road infrastructure, railway infrastructure, river infrastructure and airports [Dąbrowska and Swianiewicz 2018]. The Masovian Voivodeship is of agricultural and industrial character. In the region one can observe the fuel, energy, food and production of cattle materials. The Warsaw area is the main center for the operation of large banking and financial companies and business services.

Masovian Voivodship covers an area of 29,454 km² and has 2,353 million inhabitants [GUS 2018]. As a result of the revision of the NUTS 2016, Masovian Voivodship (so far the NUTS 2 region) has been trans-coded with effect from 1st January 2018, as the NUTS 1 region (macro-region) and divided into two new NUTS regions: The Warsaw Capital Region – (the city of Warsaw – NUTS 3 Warsaw West – “warszawski zachodni” and Warsaw East – “warszawski wschodni”) and the Masovian Region, which includes the remaining part of the voivodship. Due to the differences in the level of socio-economic development through sta-

tistical separation from the Warsaw Capital Region, the Masovian region will continue to benefit from European Union funding.

Norte Region (Northern Portuguese region) extends to 21,300 km² and has about 3.6 million inhabitants, representing 23% of the total area of the country and about 35% of the Portuguese population. The region can be divided into a coastal area, which is overwhelmingly urban and much more industrialized, and the inland area, where agriculture still plays an important role. The region is characterized by traditional sectoral industries (including: textile industry, production of apparel, production of footwear, metals industry), but it also covers medium and high-tech sectors, in particular the industries of industrial equipment, automotive parts, pharmaceuticals, precision equipment, communication equipment and computers.

TRANSPORT INFRASTRUCTURE

Well-developed economic infrastructure is an important factor determining economic growth and sustainable regional development. One of its main components is transport infrastructure. Transport infrastructure is a man-made basic, for permanent localized roads of all modes of transport, transport points, auxiliary equipment facilitating the handling of roads and transport points [Kaczyńska and Korycińska 2014]. The belief that transport infrastructure plays a capital role for development and cohesion is not confined to policy circles. In many ways, it stems from economic theory. Transport infrastructure has represented one of the cornerstones of development and cohesion strategies in the European Union (EU) and elsewhere in the world. However, despite the considerable funds devoted to it, its impact remains controversial [Crescenzi and Rodríguez-Pose 2012]. The degree of development of the infrastructure, particularly the transport one, determines the location of the economic activity, since it is an important factor in the localization of the activities or sectors that can flourish in the respective economies and regions. The high level of infrastructure development reduces the distance between regions and positively influences the integration of the domestic market and, at low cost, integrates it into the world economy system [Miłaszewicz and Ostapowicz 2012].

RAILWAY INFRASTRUCTURE

Differentiation in access to railway infrastructure is due to several factors. First, Masovian Voivodship is located in the center of the continent, therefore, the demand for transport services is much higher. The lowland nature of the center of Poland allows for cheaper implementation of railway investments, while Portuguese investments in area with higher altitude differences, are more capital-intensive. Both countries have a different approach to shaping their transport policy. There is a greater fluctuation in the length of railway infrastructure in Poland, which results directly from the renovation of rail traction. Small changes in Portugal were due to the closure of part of the railway line in the Norte Region.

Investment activities in the field of rail transport are diverse and depend above all on local circumstanc-

es, including the existing traction network, since the construction of new railway lines nowadays is quite rare. The vast majority of investments in this area are the modernization of existing railway lines, allowing high-speed trains to run.

AIRPORT INFRASTRUCTURE

When looking at both regions, one can notice differences in the number of airports as well as in the use of air services. The Norte Region provides vast services in the area of touristic air traffic. It is also not negligible to have overseas territories by Portugal and to organise cyclic flights to the Azores or Madera. However, the largest airport in Poland is located in the Masovian Voivodship. The tourist function factor makes the growth rate of air traffic in the Norte Region greater than in the Masovian Voivodship.

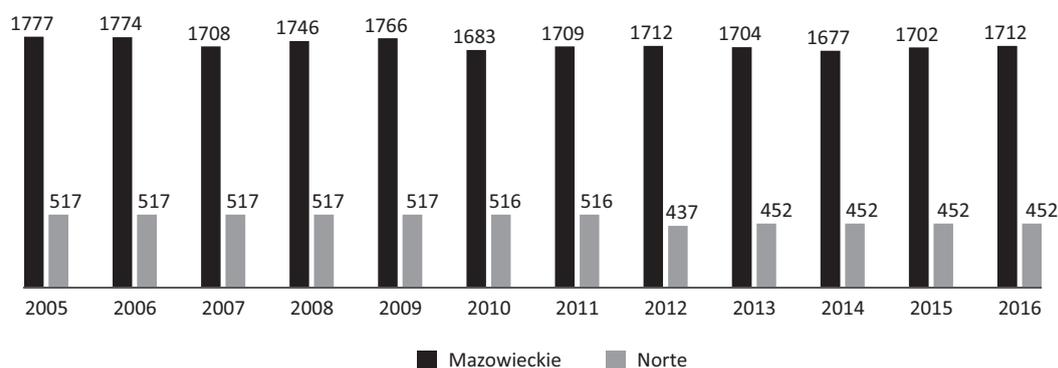


Fig. 1. The length of the railway infrastructure in the Masovian Voivodship and Norte Region (km)

Source: Own elaboration based on Eurostat database.

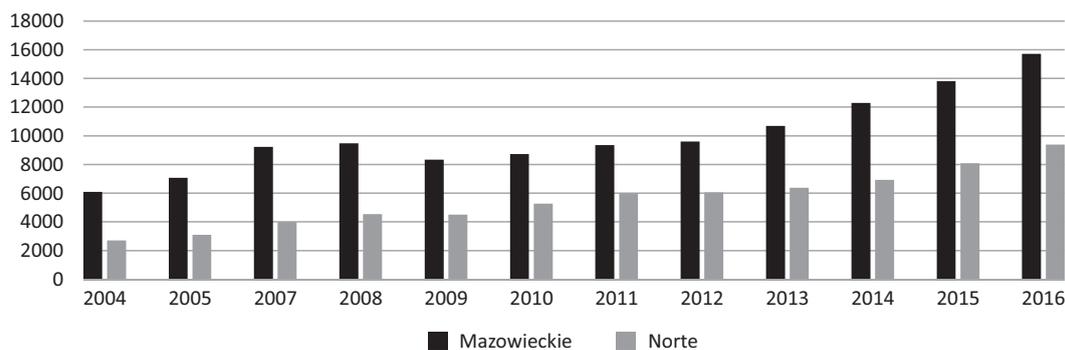


Fig. 2. The number of passengers of airports located in the regions (1,000 passengers)

Source: Own elaboration based on Eurostat database.

Table. Airports located in the Norte Region and the Masovian Voivodship

City	ICAO airport code	IATA airport code	Airport name
Norte, Portugal			
Braga	LPBR	BGZ	Braga Airport (<i>Aeródromo Municipal de Braga</i>) (Palmeira, Braga)
Bragança	LPBG	BGC	Bragança Airport (<i>Aeródromo Municipal de Bragança</i>)
Chaves	LPCH	CHV	Chaves Airport (<i>Aeródromo Municipal de Chaves</i>)
Espinho	LPIN	–	Espinho Airport (<i>Aeródromo de Espinho</i>)
Maia (Municipal da Maia)	LPVL	–	Maia Airport (<i>Aeródromo Municipal da Maia</i>)
Mirandela	LPMI		Mirandela Airport (<i>Aeródromo Municipal de Mirandela</i>)
Porto	LPPR	OPO	Francisco Sá Carneiro Airport (<i>Aeroporto Internacional Francisco Sá Carneiro</i>)
Vila Real	LPVR	VRL	Vila Real Airport (<i>Aeródromo Municipal de Vila Real</i>)
Mazowieckie, Poland			
Warszawa	EPWA	WAW	Lotnisko Chopina w Warszawie
Nowy Dwór Mazowiecki	EPMO	WMI	Port lotniczy Warszawa-Modlin
Radom	EPRA	RDO	Port lotniczy Radom-Sadków

Source: Own elaboration based on: Aeroporto de Portugal, Annual Report 2017, Porty Lotnicze S.A. website.

Much more saturated airport infrastructure can be noticed in the Norte Region, where eight airports are located. One of them, an airport in Porto, has international airport status, whereas other airports serve regional flights. Only the airport in Porto is large enough to handle international flights. Other airports in the Norte region are small local airports, the size of which does not allow large commercial aircraft to be served. However, they can successfully support local air traffic and in the future, after extension, be an alternative to major airports. The airport base in norte is well spatially distributed and can be a competitive advantage in the future. In the Masovian Voivodship there are only three civilian airports. The airports in Warsaw and Modlin operate international flights, while at the airport in Radom there are no scheduled flights since 30 October 2017. The airport placement policy is therefore quite different. The airports in Poland are located in larger towns with convenient rail transport. There are far more regional airports in Portugal, a factor, which can be a competitive advantage

in the future. The largest airport in the Norte Region is the airport in Porto, which serves the vast majority of the connections of the region [Carballo-Cruz and Costa 2014]. The availability of airport infrastructure as well as a convenient network of connections and access to airports is undoubtedly one of the key factors for the development of the regions in the 21st century. According to Olipr [2010], they can also be considered as a condition for the positive impact of air transport on the development of cities and regions.

ROAD INFRASTRUCTURE

In the regions being compared, a differentiated level of development of available road infrastructure and other approach to investment in the expansion of roads and equipment for car transport can be noticed. First of all, it should be noted that the road infrastructure in the whole of Portugal is much more developed than in Poland, as evidenced by the value of the index published by the World Economic Forum in *Global*

Competitiveness Report. According to this source, the road quality index for Portugal was 6.02 and for Poland 4.10 in the years 2016–2017. At the same time, it should be noted that the value of this index has increased for Poland since the year 2013 (3.55) and for Portugal has fallen (6.34). However, it is still much higher than the EU average. In Portugal there are more than 11,000 km national roads and about 90,000 km of municipal roads, while in Poland there are 419,000 km roads in general. In the broader sense, it can be seen that a quarter of the national roads in Portugal are highways, while in Poland the expressways (motorways and expressways) account for less than 0.5% of the total of roads [Eurostat 2018c]. It is difficult to present statistics on the roads in the Norte Region, which results from a comprehensive approach to the road system in Portugal. The most important road transport routes are: the A1 motorway connecting the region with the capital of the country, the construction of which took place between 1960–1991, the A4 motorway, leading through the Douro Valley to the northwest of the country, and the A3 motorway connecting Porto and Valença. It should be noted that most of the expressways in the region and in the whole of Portugal are toll. In the Masovian Voivodship in 2016 there were only 66 km of highways and more than 8 km of expressways per 1,000 km². This shows that, despite the important communication center located almost in the heart of Europe, there is a lack of the hinterlands for road transport which would contribute to the development of the region. Undoubtedly, road investments are one of the areas, from which the Masovian Voivodship could take an example from the Norte Region. The concept of developing this kind of communication infrastructure is missing.

SYNTHESIS AND CONCLUSIONS

Transport infrastructure is one of the most important factors for regional development. It provides communication between regions and reduces travel time. It can also be said that it draws the regions and urban centres closer together. The paper has attempted to synthesize three components of the European transport system in two regions: the Masovian Voivodship and the Norte Region. The analysis shows that both

regions differ in terms of equipment in transport infrastructure as well as on planning investments in this area. In the Masovian Voivodship, the process of investing in terrestrial infrastructure is more diversified because the railway is heavily developed. However, in the Norte Region wheeled transport, supported by regional airports, is preferred. The process of planning and implementing these investments was subject to certain factors: the lowland form of the site in Masovia and the large diversity of terrain in the Norte Region. The shape of the transport in both countries has been influenced by the factor of the position in relation to other countries and its touristic function. Portugal and the Norte Region play no major role in transit traffic in Europe. Consequently, Portuguese regions in the process of shaping their investments must have been paying lesser attention to this external factor. Both regions have shaped their own policy of implementing transport infrastructure investments, and in both countries the factor that enabled them implementing it was joining the EU structures.

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ZNACZENIE INFRASTRUKTURALNYCH INWESTYCJI TRANSPORTOWYCH W ROZWOJU REGIONALNYM REGIONU NORTE W PORTUGALII ORAZ WOJEWÓDZTWA MAZOWIECKIEGO W POLSCE

STRESZCZENIE

Celem artykułu było porównanie kierunków inwestycji w infrastrukturze komunikacyjno-transportowej regionu Norte w Portugalii oraz województwa mazowieckiego w Polsce. Analizując nasycenie infrastrukturą, zwrócono szczególną uwagę na aspekt inwestycyjny, ponieważ jest to czynnik mający zasadniczy wpływ na rozwój tychże regionów. Przeprowadzone badania wykazały znaczące różnice w procesie inwestycyjnym. Województwo mazowieckie mocniej dywersyfikuje inwestycje infrastruktury transportowej na różne gałęzie transportu. Z kolei w regionie Norte zauważyć można mocne ukierunkowanie inwestycji w transportie nastawione na rozbudowaną sieć dróg szybkiego ruchu oraz duży dostęp do lotnisk lokalnych. Tak rozumiane lokowanie inwestycji transportowych w poszczególnych gałęziach transportu związane jest z różnymi warunkami położenia obu regionów.

Słowa kluczowe: infrastruktura transportowa, inwestycje infrastrukturalne, województwo mazowieckie (Polska), Norte Region (Portugalia)

CHANGES IN EUROPEAN UNION FARM STRUCTURE AND THEIR MULTIDIMENSIONAL IMPLICATIONS

Alina Daniłowska  

Warsaw University of Life Sciences – SGGW

ABSTRACT

The aim of the paper was to identify the tendencies in the farm structure in EU-28 countries from 2008 till 2016 and point out their implications. The analyses revealed that during the examined period the very impressive decrease in total farm number was observed. The changes of farm number and of farm structure by size class (in UAA) were very differentiated between countries. The increase in the share of the biggest farms in farm number and especially in utilised agricultural area indicates advanced process of agricultural land concentration in many EU countries. The highest concentration was observed in some post communistic countries, but it was very progressive in such important agricultural product producers as German, Denmark, France, Spain as well. The changes in farm structure have important implications for political power of farmers as an interest group at national and the EU level. They influence the provision of environmental and non-environmental public goods as well.

Key words: farm structure, farm number, agricultural land, agricultural land concentration

INTRODUCTION

The farm structure and its changes are very important phenomena from the micro and macroeconomic perspectives. As Stanton [1991] points out, the issues connected to farm structure revolve around changing distributions within the sector, production decisions and who makes them, resource ownership and control over their use. Thus it is an subject of interest of different kinds of economic policy. Initially it was a domain of the interest of the agricultural policy, next rural development policy, now days beside aforementioned, the other ones like environmental, regional and social policies. The farm structure affects the distribution of incomes from agricultural activity and benefits from many support measures offered under aforementioned polices. However, it is necessary to underline that the programs influence the farm structure as well. In

the European Union (EU) the farm structure is under steady monitoring and is examined in regular intervals in order to: assess the agricultural situation across the EU, monitor trends and transitions in the structure of European farms, manage, evaluate and design the Common Agricultural Policy (CAP) in its environmental, economic and social aspects [Eurostat 2018].

There are many examinations of the different aspects of farm structure and its changes in literature. This interest reflects the importance of the phenomenon. To illustrate the vast range of dimensions of the issue some research can be indicated. Brown et al. [1994] examined implications of structural changes in the U.S. agriculture for small scale African American farmers. Ciaian et al. [2009] focused on recognition of implications of farm structure for product specialisations and their competitiveness on international markets and role of the transaction costs in agriculture of

Alina Daniłowska  <https://orcid.org/0000-0002-4977-3210>

 alina_danilowska@sggw.pl

transition countries. Ondersteijn et al. [2003] showed the impact of farm structure and farm management on the nutrient surpluses. Popescu et al. [2006] examined the changes in farm structure and land concentration in Romania and Bożek [2016] in Poland. Marks-Bielska [2016] considered determinants of the regional diversity of the farm area structure in Poland.

The aim of the paper is to identify the tendencies in the farm structure in EU countries in years 2008–2016 and point out their implications of general character concerning the EU countries or at least the majority of them. In the paper some problems are analyzed: (i) the tendencies in the farm number and in the farm structure by size class (UAA); (ii) scope and country differentiation of agricultural land concentration; (iii) implications of changes in farm structure.

MATERIAL AND METHODS

The study encompasses 28 EU member countries. In the paper the term “farm” refers to all kinds of agricultural holdings regardless their legal form.

Eurostat database was the main source of data on number of farms and the agricultural land area. The examination was carried out generally for the years 2008–2016¹. The period of analyses stemmed from the fact that data for all current members of the EU have been available since 2007², and the 9 years long period is enough for revealing the credible mid-term tendencies.

In the EU once in ten years a census and every 3 or 4 years the Farm Structure Survey (FSS) are carried out. The last³ census was in 2010 and the last FSS in 2016. In examined period, the methodology of the subsequent surveys was changed in respect to the farm definition. Until 2007, with some exceptions: Poland, Romania Latvia, Bulgaria Greece, German⁴ the FSS covered all farms of utilised agricultural area (UAA)

at least 1 ha as well as farms of less than 1 ha if they fulfilled other criteria expressed as natural thresholds like number of animals or area under particular plants. In census in 2010 in some countries the minimum threshold increased: to 5 ha of UAA in the Czech Republic, Denmark, Germany, Sweden⁵ and the United Kingdom⁶, to 3 ha in Luxembourg, to 2 ha in Slovakia, to 1 ha in Poland. In the Netherlands, where value of standard output was a criterion, the threshold was lowered to EUR 3,000. The other criteria expressed in natural thresholds were generally lifted up [Eurostat 2018]. The FSS in 2013 and 2016 accepted the thresholds for 2010 with minor modifications.

The change in farm number is shown by indexes of dynamics in absolute figures. Changes in farm structure is characterised by the shares of the farm groups by size class (in UAA) in total number of farms. The process of land concentration is reflected by the comparison of shares of the farm groups in total UAA in 2007 and 2016. Identification of the implications of the changes in farm structure is based on the relevant literature studies.

RESULTS AND DISCUSSION

Tendencies in number of agricultural farms in EU countries and its implications

The number of farms differs between members of the EU very noticeably what stems from the set of economic, social, political, geographical reasons. In 2016, the total number of farms in the EU was amounted at ten and quarter millions and was lower by three and half millions in comparison to 2007 (Table 1) so it declined by 24%. It was a quite big decrease taking into consideration only 9 years long period. The fall took place in all countries except the Ireland. Its extent varied between countries from 63% for Slovakia to 6% for Portugal (Fig. 1). Deeper insight in the tendencies

¹ It is assumed that data obtained in FSS in 2007 reflect the situation on the end of 2007.

² Bulgaria and Romania joined EU in 2007 and have shared their data on farm structure with Eurostat since 2005 while Croatia that joined EU in 2013, since 2007.

³ From the year of 2018 perspective.

⁴ In Poland, Romania Latvia, Bulgaria Greece the threshold was lower than 1 ha of UAA, in German it was 2 ha.

⁵ In 2010, 5 ha of UAA threshold was introduced as an alternative criterion to 2 ha of arable land threshold.

⁶ The UK submitted the revised version of FSS 2007 dataset with the 2010 threshold applied.

Table 1. Farm number and its dynamics in EU countries in 2007–2016

Country	Farm number		Dynamics (basic year = 100)			
	2007	2016	2010/2007	2013/2010	2016/2013	2016/2007
Belgium	48 010	36 890	89.3	88.1	97.7	76.8
Bulgaria	493 130	202 720	75.1	68.7	79.7	41.1
Czech Republic	39 400	26 530	58.0	114.8	101.1	67.3
Denmark	44 620	35 050	92.7	92.6	91.6	78.6
Germany	370 480	276 120	80.7	95.3	96.9	74.5
Estonia	23 340	16 700	84.0	97.9	87.0	71.6
Ireland	128 240	137 560	109.1	99.8	98.5	107.3
Greece	860 150	684 950	84.1	98.1	96.5	79.6
Spain	1 043 910	945 020	94.8	97.5	97.9	90.5
France	527 350	456 520	97.9	91.5	96.7	86.6
Croatia	181 250	134 460	128.7	67.5	85.4	74.2
Italy	1 679 440	1 145 710	96.5	62.3	113.4	68.2
Cyprus	40 120	34 940	96.9	91.0	98.8	87.1
Latvia	107 750	69 930	77.4	98.1	85.5	64.9
Lithuania	230 270	150 320	86.8	85.9	87.5	65.3
Luxembourg	2 300	1 970	95.7	94.5	94.7	85.7
Hungary	626 320	430 000	92.1	85.2	87.5	68.7
Malta	11 020	9 210	113.7	74.7	98.4	83.6
Netherlands	76 740	55 680	94.2	93.3	82.5	72.6
Austria	165 420	132 500	90.8	93.5	94.4	80.1
Poland	2 390 960	1 410 700	63.0	94.8	98.7	59.0
Portugal	275 080	258 980	111.0	86.6	97.9	94.1
Romania	3 931 350	3 422 030	98.2	94.1	94.3	87.0
Slovenia	75 340	69 900	99.1	97.0	96.6	92.8
Slovakia	68 990	25 660	35.5	96.4	108.9	37.2
Finland	68 230	49 710	93.6	85.2	91.4	72.9
Sweden	72 610	62 940	97.9	94.5	93.7	86.7
United King.	226 650	185 060	81.7	98.8	101.1	81.7
EU	13 808 470	10 467 760	88.7	88.5	96.6	75.8

Source: Own calculations based on Eurostat database.

in three-years long periods showed the big differences in the rates and directions of the changes. Generally, the biggest changes in farm number took place in years of 2011–2013 as in 14 countries the rates of dynamics were at the highest level, while in the first sub term (2008–2010) in 11 countries and in third one (2014–2016) only in 4 countries. In the countries with the

deepest fall in the first 3 examined years, the rates of decline in following two periods were relatively small and in 3 countries (the Czech Republic, Slovakia and the United Kingdom) they were positive at least for one period, however, they did not overcome the initial fall. In the first 3 years, in Ireland, Croatia, Hungary and Malta the number of farms increased noticeably,

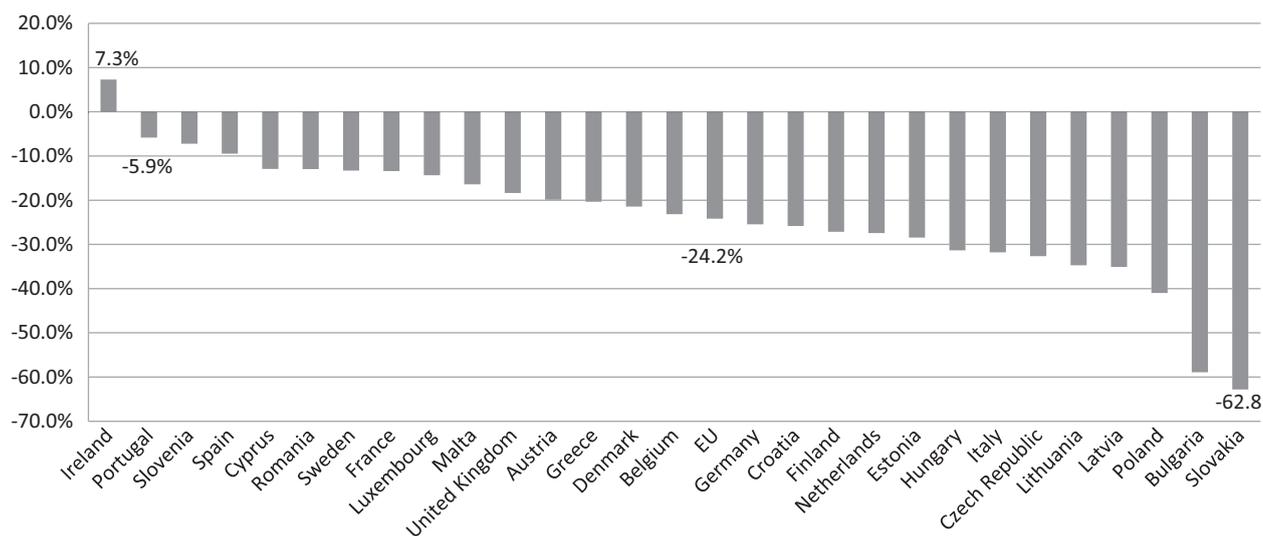


Fig. 1. The change in farm number in EU countries in 2008–2016 (%)

but only in Ireland that growth was not consumed by the fall in the following years.

The aforementioned changes in the methodology influenced the result certainly. The impact of the modification can be estimated at about one million farms⁷. The biggest reduction due to this change took place in Poland where the introduction of the 1ha threshold excluded from the survey about 900,000 farms. The decrease in farm number in the other countries because of this reason was in absolute terms rather modest, but in some countries like Slovakia and the Czech Republic the fall, in relative terms, was enormous as in years 2008–2010, the number of farm plummeted by 65 and 42% respectively. The opposite phenomena in Ireland can be partly tied to abandoning the threshold of 1 ha UAA. To conclude, in examined years, though the fall in farm number due to methodology, the consolidation of the EU agriculture was proceeding at a rapid rate.

The fall in farm number suggests the possible reduction of political power of farmers as an influencing group of interest, more precisely of political parties representing the farmers' interests at national and the EU level. Economists indicate that a very high level of economic support for agriculture in general or for some agricultural product or activities is partly the result of

lobbying by farm organisations [Ray and Henning 1999, Nedergaard 2006, Zawojcka 2011, Hvid 2014, Poczta-Wajda 2016]. However, the process of weakening of farmers' political power does not necessary lead to quick fundamental change of CAP and domestic agricultural policies as a high degree of path dependency in the agricultural policy development process is observed [Kay 2003, Ackrill and Kay 2006, Furtan et al. 2008]. Hess et al. [2008] underline that path dependent political decisions do not always can be explained by economic criteria such as rents created by a policy.

Tendencies in the farm distribution by size class (in UAA) in EU countries

The decrease in farm number by 24% in the presence of the nearly unchanged (-0.4%) total UAA in the EU indicates that in the course of examined years the process of land concentration took place. In some countries, mainly former post communistic ones, the area of agricultural land increased while the number of farms decreased. Although in majority of the EU member countries area of agricultural land decreased (in some countries noticeably), the fall in the farm number was deeper. In result, in the EU the average per farm agricultural land area increased from 12.6 to 16.6 ha (by 32%).

⁷ The estimation is based on the comparison of the numbers of the smallest farms in 2007 and 2010 in countries where the modification of thresholds took place.

Table 2. Farm distribution by size class (in UAA) in 2007 and 2016 (%)

Country	Farm size class									
	< 5 ha		5–19.99 ha		20–49.99 ha		50–99.99 ha		≥ 100 ha	
	2007	2016	2007	2016	2007	2016	2007	2016	2007	2016
Belgium	25.5	13.9	28.5	30.6	27.8	30.2	14.2	18.6	4.1	6.7
Bulgaria	94.9	82.6	3.2	8.5	0.7	4.1	0.4	1.8	0.9	3.0
Czech Republic	50.4	18.7	21.6	36.4	11.3	17.9	5.9	9.2	10.8	17.8
Denmark	3.8	4.4	38.6	39.3	23.5	20.9	15.9	13.4	18.3	21.9
Germany	22.6	8.6	32.3	36.7	22.1	24.1	14.4	17.4	8.6	13.3
Estonia	36.1	31.6	39.8	37.1	12.9	13.7	4.5	6.3	6.6	11.4
Ireland	6.5	7.4	36.4	36.0	39.3	38.6	14.2	14.4	3.5	3.6
Greece	76.2	77.3	19.5	18.4	3.5	3.4	0.68	0.72	0.1	0.2
Spain	52.8	51.6	26.8	26.8	10.7	10.8	4.8	5.3	4.9	5.5
France	24.7	24.3	19.1	18.2	18.8	16.3	20.2	19.4	17.1	21.9
Croatia	77.1	69.5	19.1	22.0	2.8	4.7	0.7	2.6	0.3	1.2
Italy	73.3	61.9	19.4	26.1	5.0	7.8	1.6	2.6	0.8	1.5
Cyprus	86.4	89.6	10.6	7.7	2.0	1.7	0.6	0.7	0.35	0.34
Latvia	40.9	35.2	44.4	43.5	10.0	12.5	2.7	4.1	2.1	4.6
Lithuania	60.5	50.0	30.9	34.7	5.6	8.1	1.7	3.7	1.3	3.5
Luxembourg	17.8	16.2	17.4	16.8	17.0	15.7	30.0	27.4	18.3	24.4
Hungary	89.4	81.4	6.6	11.1	2.0	3.8	0.9	1.7	1.0	2.0
Malta	97.4	96.4	2.5	3.5	0.0	0.1	0.0	0.0	0.0	0.0
Netherlands	28.0	20.2	30.1	28.7	27.4	29.7	12.0	16.8	2.5	4.7
Austria	33.5	31.0	39.6	37.4	20.1	23.1	4.8	6.4	2.0	2.1
Poland	68.5	54.3	26.3	36.1	4.2	7.2	0.7	1.6	0.3	0.9
Portugal	72.6	71.5	19.5	19.3	4.4	5.0	1.6	1.8	2.0	2.4
Romania	89.8	91.8	9.4	7.1	0.4	0.5	0.1	0.2	0.2	0.4
Slovenia	59.0	59.5	36.8	34.7	3.7	4.9	0.4	0.7	0.1	0.2
Slovakia	87.2	55.7	6.6	23.8	2.0	7.5	1.1	3.7	3.1	9.4
Finland	9.1	4.0	33.3	33.1	36.5	33.0	16.3	19.8	4.8	9.9
Sweden	14.7	10.5	37.8	45.2	22.9	19.7	13.8	11.8	10.9	12.9
UK	19.0	10.3	26.8	29.4	20.7	22.5	15.9	17.0	17.6	21.0
EU	70.3	65.6	18.7	20.4	5.9	7.1	2.9	3.6	2.2	3.3

Source: Own calculations based on Eurostat database.

Moreover, in the course of nine years, the structure of farms by class size (in UAA) changed (Table 2).

In years 2007–2016 the number of the farms smaller than 5 ha of UAA dropped in the EU by nearly 30% what resulted in fall of their share in total farm number by 5 percentage points (p.p.). The reduction of the share took place in 22 EU countries. The highest drop was observed in Poland, Slovakia, the Czech Republic and Germany, however, as it was mentioned, it stemmed partly from the modification of a methodology. For the remaining 18 countries, the fall varied from two-digit level: Bulgaria – 12.3 p.p., Belgium – 11.6 p.p., Italy – 11.2 p.p., Lithuania – 10.5 p.p., to about 1 p.p.: France – 0.5 p.p., Portugal – 1.1 p.p., Spain – 1.2 p.p. In 6 countries: Denmark, Ireland, Greece, Cyprus, Romania, Slovenia, the share of the smallest farms climbed slightly.

In the case of the farms of the size 5–19.99 ha of UAA, the number of countries with the increase in share equalled the number of countries with the decline. The highest growth was in Slovakia and the Czech Republic – 17.2, 14.7 p.p. respectively, while the highest decrease in Cyprus, Estonia, Romania – 2.9, 2.8, 2.3 p.p. respectively. The shares of the middle size farms – 20–49.99 ha of UAA – increased in 20 countries and the size of the changes varied from 6.6 p.p. for the Czech Republic to 0.1 p.p. for Spain, Romania, Cyprus. For farm class of 50–99.9 ha UAA, the advancement was observed in 23 countries while loss in 4 countries.

The most interesting and important phenomena concerns the biggest farms – 100 ha of UAA and more. In 2007–2016 their number climbed by 12.2% in the EU. At the beginning of the examined period they accounted for 2.2% of the total farm number in the EU and 9 years later for 3.3%. Contributions of such farms rose in 26 countries, while in Cyprus and Malta remained stable.

To sum up, during the examined 9 years there was near-continuous tendency for the share of the group of farms 5 ha UAA and more to increase in 12 countries. In 8 countries it was observed for farms of area 20 ha of UAA and bigger, in 4 countries for farms bigger than 50 ha of UAA. In France and Luxembourg only the biggest farms improved their share but the increase was enormous: 4.8 and 6.1 p.p. respectively.

The process of polarisation of the farms is a very interesting and worth to point out phenomenon. It was observed in Denmark, where the shares of the farms smaller than 20 ha and bigger than 100 ha UAA increased, while in Ireland and Greece the phenomenon concerned the groups of farms to 5 ha and bigger than 49.99 ha.

Tendencies in agricultural land distribution and their implications

The data on the changes in distribution of the agricultural land by farm size class indicate that in examined period the process of land concentration took place. The scope of the phenomenon varied between countries noticeably. In 2007 the group of the smallest farms in the EU cultivated 8.4% of UAA, but in Malta about 80%, in Romania 35%, while in 7 countries less than 1%: the Czech Republic, Denmark, Ireland, France, Luxembourg, Finland, the United Kingdom (Table 3).

It is very remarkable that in years 2008–2016 the share of the smallest farms fell in every EU country, on average in the EU by 2.4 p.p. Although, in majority of the EU members the decline was not big – below 2 p.p., in some countries the growth was much higher: in Croatia it was 11.3 p.p., in Greece 8.0 p.p., in Lithuania 7.5 p.p., Bulgaria 7.1 p.p. (Fig. 2). The drop concerned the farms of size 5–19.99 ha as well. In the EU it is estimated at 2.3 p.p. The very little rise took place only in four countries – the Czech Republic, Hungary, Malta, Slovakia and Sweden. In the farm group of size 20–49.99 ha of UAA in 17 countries the fall continued while in 11 countries the modest increase took place. In the EU, the share of farms of area of 50 ha and more proceeded to decline although, the fall took place only in 11 countries, among them in France, Denmark Germany, the United Kingdom, Ireland. What is interesting, in these countries, the share of other groups fell.

As a result of shown phenomena, the role of the biggest farms of size 100 ha of UAA and more rose remarkably in majority countries. Only in the Czech Republic, Spain, Hungary, Austria, Slovenia and Slovakia it dropped slightly. In result, in the EU, the biggest farms cultivated more than 50% of UAA. In some post communistic countries the participation was extreme

Table 3. The distribution of utilised agricultural area by farm size class in 2007 and 2016

Country	Farm size class									
	< 5 ha		5–19.99 ha		20–49.99 ha		50–99.99 ha		≥ 100 ha	
	2007	2016	2007	2016	2007	2016	2007	2016	2007	2016
Belgium	1.8	0.9	11.3	9.7	31.9	27.3	33.9	35.3	21.1	26.8
Bulgaria	10.0	2.9	4.6	3.9	3.5	5.9	4.6	5.6	77.3	81.6
Czech Republic	0.8	0.3	2.5	2.9	4.0	4.3	4.6	5.0	88.1	87.5
Denmark	0.12	0.06	6.9	5.5	12.7	9.0	19.1	13.0	61.1	72.4
Germany	1.3	0.2	8.2	7.1	16.1	13.3	22.1	20.3	52.3	59.1
Estonia	2.4	1.3	10.5	6.4	10.1	7.2	7.9	7.5	69.1	77.6
Ireland	0.635	0.627	14.0	12.7	39.5	35.1	29.4	27.4	16.5	24.2
Greece	26.5	18.5	37.5	25.0	21.9	15.1	9.4	6.9	4.7	34.5
Spain	4.6	4.3	11.3	11.0	13.8	13.9	14.1	15.2	56.1	55.5
France	0.96	0.8	4.0	3.2	12.3	9.1	28.0	23.2	54.8	63.8
Croatia	22.7	11.4	31.6	17.1	15.3	12.5	8.3	15.8	22.1	43.2
Italy	15.9	11.7	24.4	23.3	20.4	22.1	14.4	16.3	24.9	26.6
Cyprus	28.7	28.1	27.1	22.6	16.22	16.16	11.4	14.4	16.5	18.7
Latvia	5.8	2.8	27.1	16.5	18.0	13.7	11.1	10.5	38.0	56.6
Lithuania	14.4	6.9	24.9	17.1	14.7	12.8	10.2	13.2	35.8	50.0
Luxembourg	0.6	0.5	3.2	2.7	10.3	8.0	39.1	31.1	46.8	57.7
Hungary	6.8	4.8	9.4	10.1	9.0	10.7	9.2	11.0	65.5	63.4
Malta	80.4	78.5	18.4	20.4	1.2	1.1	0.0	0.0	0.0	0.0
Netherlands	2.4	1.3	13.3	10.0	36.6	31.2	31.9	35.2	15.7	22.4
Austria	4.4	3.8	22.8	20.9	32.1	36.2	16.7	21.1	24.0	17.9
Poland	17.6	13.2	39.1	34.3	18.9	20.8	6.8	10.6	17.5	21.1
Portugal	10.0	9.1	14.6	13.1	10.7	10.8	8.8	9.0	55.9	58.0
Romania	35.1	28.7	21.4	15.8	3.5	4.4	2.4	3.3	37.6	47.8
Slovenia	21.8	19.9	51.3	46.0	16.0	20.4	3.9	6.7	7.0	6.9
Slovakia	2.7	1.5	2.2	3.2	2.2	3.2	2.7	3.5	90.2	88.6
Finland	0.8	0.2	11.8	8.7	34.6	24.2	32.5	30.5	20.3	36.4
Sweden	1.1	0.7	9.6	9.8	17.2	13.0	22.8	17.7	49.3	58.8
UK	0.4	0.3	4.0	3.6	9.5	8.0	15.7	13.6	70.4	74.6
EU	8.4	6.1	14.4	12.1	14.7	13.6	15.9	15.5	46.5	52.7

Source: Own calculations based on Eurostat database.

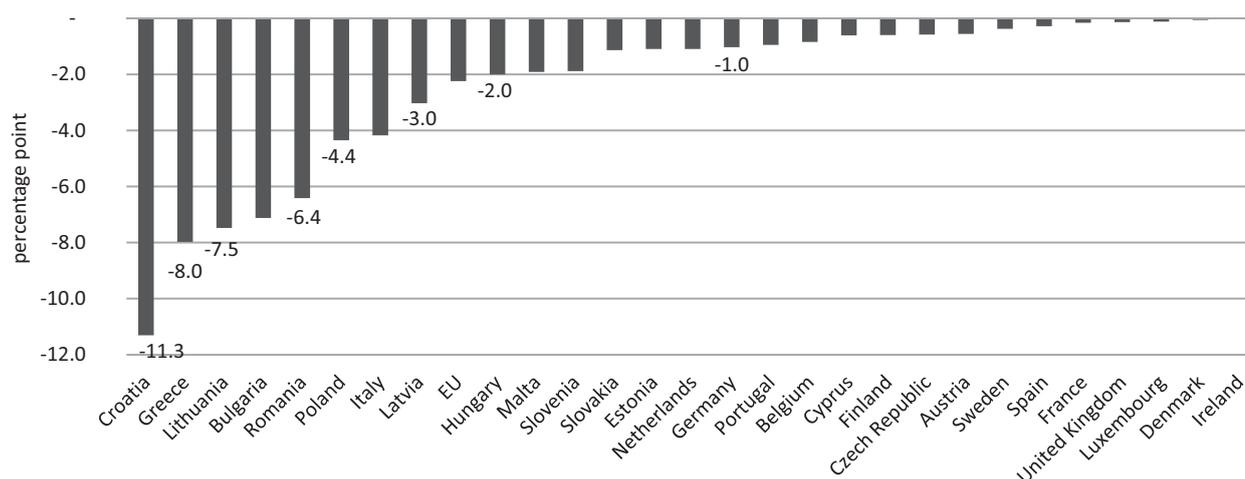


Fig. 2. The change in the share of farms smaller than 5 ha of UAA in total area of UAA in 2008–2016

high. Despite aforementioned fall, in Slovakia and the Czech Republic it got nearly 90%, in Bulgaria and in Estonia about 80%. In big, well-developed countries with strong agriculture like Germany, France, Spain (their share in the total UAA in the EU was amounted at 40%) the biggest farms conducted activity on about 60% of UAA.

Decrease in number of the smallest farms (to 5 ha of UAA) and simultaneously their share in UAA triggers very important implications. Provision of so called public goods by agriculture is one of the most interesting among them. The list of public goods linked to agriculture is long as includes environmental and non-environmental goods. Turek Rahoveanu et al. [2014] underline that all types of agriculture where land is managed properly can provide public goods. However, there are significant differences in the type and quantity of public goods, which can be provided by various types of farms. It seems that the provision of some kinds of public goods, especially social goods like cultural heritage, rural vitality, cultivating tradition requires diversified farm structure. Boyce [2014] points out a crucial role that small farms play in conserving the agricultural biodiversity. Davidova [2014] underlines their role in preventing the depopulation of rural areas. Marsh [1992] mentions not only public goods linked to agriculture but the public bads like unpleasant smells, obstruction to traditional footpaths or losses of natural habitats. The problem of such bads

is rather connected to bigger scale of production. The awareness of the importance of the provision of public goods (and bads) connected to agriculture is reflected in strong financial support in the frame of CAP in subsequent financial perspectives. Cooper et al. [2009] carried the complex examination of the problem in the EU in the first decade of 21st century. The conclusions indicated for undersupply in most of the key environmental public goods provided by agriculture. They pointed out threats for the provision of public good stemming from the pressures to concentrate and specialise production. Results of the examination showing the ongoing reduction of the farm number and the process of land concentration suggest that the provision of public goods linked to agriculture needs permanent attention and the complex measures going beyond traditional even generous financial support. It is in line with the approach of Vanni [2014] calling for more holistic interpretation of the concept of multifunctionality of agriculture and intervention in provision of public goods.

CONCLUSIONS

1. During the examined period, the very impressive decrease in the total farm number was observed in the EU. The changes of farm number and structure by size class were very differentiated between countries.

2. The fall in the farm number suggests the possible reduction of political power of political parties representing the farmers' interests at national and the EU level. However, it does not necessary lead to a quick, fundamental change of CAP and domestic agricultural policies.
3. The rise of the share of the biggest farms in farm number and especially the increase in their share in total UAA indicate very advanced process of the agricultural land concentration in many EU countries. The highest concentration was observed in some post communistic countries, but it was very advanced in such important agricultural product producers as German, Denmark, France, Spain as well.
4. Decline in number of smaller farms and agricultural land area they use and the parallel increase in the role of the biggest farms generate important implications for provision of public goods. Although some public goods can be delivered at satisfactory level by farms of different size, number of farms is very important for complex issue of rural vitality, rural heritage, biodiversity and agricultural landscapes. Their presence is a fundamental element of the counteracting against depopulation of rural areas and their social and economic degradation.

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ZMIANY W STRUKTURZE GOSPODARSTW ROLNYCH W UNII EUROPEJSKIEJ I ICH WIELOWYMIAROWE SKUTKI

STRESZCZENIE

Celem artykułu jest identyfikacja tendencji w strukturze gospodarstw rolnych u krajach Unii Europejskiej (UE-28) w latach 2008–2016 i wskazanie ich skutków. Analiza wykazała, że w badanym okresie nastąpiło duże zmniejszenie liczby gospodarstw rolnych. Zmiana ich liczby i struktury była zróżnicowana znacznie między krajami. Wzrost udziału największych gospodarstw w liczbie gospodarstw i w powierzchni użytków rolnych wskazuje na zaawansowany proces koncentracji ziemi rolniczej w wielu krajach europejskich. Największa koncentracja występuje w kilku krajach postsocjalistycznych, ale jest też zawansowana w krajach będących ważnymi producentami produktów rolnych: Niemcy, Dania, Francja, Hiszpania. Zmiana w strukturze gospodarstw ma ważne skutki dla siły politycznej rolników jako grupy interesów na unijnym i krajowym szczeblu. Wpływa ona również na dostarczanie środowiskowych i społecznych dóbr publicznych związanych z rolnictwem.

Słowa kluczowe: struktura gospodarstw rolnych, liczba gospodarstw rolnych, koncentracja ziemi

APPLICATION OF *K*-RECORDS IN THE INTERVAL ESTIMATION OF THE VALUE AT RISK MEASURE (VaR)

Marcin Dudziński  , Ewa Wasilewska 

Warsaw University of Life Sciences – SGGW

ABSTRACT

Value at Risk, or shorter – VaR, is a major tool used in the processes related to the risk management of banks and other monetary institutions, as well as in the tasks connected with financial supervision and scrutiny. The VaR measure may be interpreted as the minimum amount of equity that the company should own in order to be able to cover its potential losses. Although many methods leading to VaR estimation have been established so far, there is still no universal and faultless approach of VaR calculation. In our work, the method of VaR estimation consisting in determination of confidence intervals for VaR in terms of the so-called *k*-records has been described and used. The proposed approach is illustrated with use of an example from banking sector, concerning the stock prices of PKO BP Bank in the period between 13.01.2017 and 22.03.2018.

Key words: risk measures, value at risk, *k*-records, quantiles, interval estimation

INTRODUCTION

Value at Risk (VaR) is considered – both by practitioners and theoreticians of financial markets – to be one of the most popular measures of the financial risk assessment. It is mostly used in the assessment of the market risk, i.e. the risk arising from changes in values of the owned assets, but it is also applied in order to measure other kinds of risk, like the credit and operational risks [Chlebus 2014].

Value at Risk denotes the maximal financial loss that some bank or other financial institution may incur by investing in some sets of securities in the given time horizon with a certain probability called the confidence level [Jajuga 2001]. In other words, VaR is a statistical risk measure, which determines the potential limit loss in a share portfolio that may occur with a given confidence level $1 - \alpha$ in a fixed time interval (Δt) [Łukaszewski and Kostur 2013]. In practice, pro-

vided that the confidence level is $1 - \alpha$, VaR is treated as the maximal value of loss that may be incurred in the given time period in $1 - \alpha \cdot 100\%$ cases. Instead of the coefficient level $1 - \alpha$ (which is close to 1), the so-called tolerance level α (which is close to 0) may be considered. It is worthwhile to mention that the lower tolerance level is or the longer time horizon is, the higher VaR is [Kuziak 2003].

As a risk measure, VaR has gained in importance at the turn of the 1980s and 1990s, when the Basle Committee on Banking Supervision stated that banks should be able to cover losses on their trading portfolios over a ten-day time horizon, 99% of the time, and simultaneously it recommended to apply the VaR measure for calculating those losses. All of the corresponding regulations stem from the two Basel Accords – the so-called Basel I and Basel II Accords [Balcerowicz 2008].

Although VaR is a commonly used risk measure, its estimation still remains a vital practical challenge,

as the homogenous and reliable method of its calculation has not been worked out yet. To the major drawbacks of the so far applied methods of VaR calculation belong: the necessity of making an assumption on the distribution of the considered rates of return (it is often assumed that they have normal distribution, which is usually not in accordance with the real facts), as well as the necessity of the parameter estimations based on long series of historical data (with an assumption that the rates of return of the given financial tool are invariable, which may also differ from reality).

We should emphasize that the methods of VaR estimation, which are nowadays used by banking institutions, usually tend to overestimate its value. It leads to overestimation of capital requirements in the context of the market risk evaluation [Chlebus 2014]. Application of too conservative models for the purpose of VaR estimation results in significant reassessment of the possessed portfolio of assets, which may lead to a non-effective implementation of the entrusted capital by banks, or may even cause a considerable slowdown in economic growth [Perignon et al. 2007, cited by Chlebus 2014].

The objective of our study is to propose and describe a method of interval estimation of the Value at Risk (VaR) measure with use of the so-called k -records and its applications in the evaluation of risk in the chosen bank institution. It is a distribution-free method, i.e. it does not require any knowledge regarding the distribution of gains/losses of the given financial tool, which is very useful in analysis of time series consisting of daily stock prices or rates of return.

The presented method uses the idea of interval estimation of quantile, introduced by Ahmadi and Balakrishnan [2009] in the form of a result that is cited as Theorem 1 in the further part of our paper. To the best of our knowledge, this result has not been overly exploited in empirical studies devoted to the analysis of risk measures so far, and from this perspective we may treat it as an implementation of the already existing, but – to some extent – new method.

Additionally, among other advantages of the proposed method – except for the earlier mentioned fact that it allows to obtain distribution-free confidence intervals for VaR – we mention the fact that this method is computationally tractable and it can be easily used

in practice. We hope that the presented research will make a significant contribution to further developments and discussions in the area of VaR estimation.

The introduced method of determination of the confidence intervals for VaR in terms of k -records will be shown by using data consisting of the stock exchange quotations of Poland's largest bank PKO BP Bank. We justify such a choice of data by the fact that PKO BP Bank is one of the largest stock exchange quoted companies in Poland, as well as by the fact that its shares form a significant part of many investment portfolios of the country.

The considered dataset has been collected from the data contained on the website BiznesRadar.pl and is comprised of 300 closing stock prices of PKO BP Bank from the period between 13.01.2017 and 22.03.2018. The decisive factors for a selection of such a period were: the requirement that the size of data should be sufficiently large (to obtain sufficiently precise estimated value), and the condition that these data should be possibly most up-to-date. The assumed time horizon fulfills both of these criteria. Additionally, in order to avoid the New Year's effect, the closing prices from the beginning of 2017 have been omitted.

All of the conducted computations were carried out with use of R, which is an open source software environment for statistical computing and graphics, freely available under the GNU General Public License.

Review of the literature devoted to the issue of VaR estimation

To the most commonly used methods of VaR estimation belong: the variance-covariance approach, historical simulations, the Monte Carlo method, the quantile estimation, the extreme value approach, the method applying the so-called Archimedean copulas. Among the publications in which the subject matter of VaR evaluation is considered, the works by: Jorion [1997], Pritsker [1997], Dowd [1998], Artzner et al. [1999], McNeil and Frey [2000], Grabowska [2000], Jajuga [2001], Fernandez [2003], Wüthrich [2003], Cotter and Dowd [2006], Danielsson and Zigrand [2006], Dudziński and Furmańczyk [2009], McAleer et al. [2011], Iskra [2012], Chang et al. [2013], Luszczyn [2013], Furmańczyk [2016] are especially worthwhile to mention.

A comprehensive methodology of VaR calculation has been given by Jorion [1997]. An author claims there that VaR is an excellent tool that allows – with help of easily interpretable figures – to estimate a diverse number of financial risk categories, and which simultaneously provides a measure that is very supportive in making strategic financial decisions. Additionally, it has been pointed out in the paper by Dowd [1998] that VaR may find widespread applications in various areas of risk management, in particular in financial forecasting. Furthermore, the works by Danielsson and Zigrand [2006] and McAleer et al. [2011] also contain thorough reviews of the methods of VaR evaluation. In turn, Pristker [1997] regards the approach based on the Monte Carlo simulations as the primary method of VaR estimation on the financial market, whereas Cotter and Dowd [2006] advise to use the Monte Carlo approach as one of the most accurate methods of the risk measures calculations based on the quantile estimation, including the estimation of VaR. On the other hand, in the paper by Artzner et al. [1999], the notion of a coherent risk measure has been introduced and in particular, the conditions under which the corresponding measure is coherent have been determined. The justification that VaR is not such a coherent measure has been given there as well. In addition, in the works by McNeil and Frey [2000], Jajuga [2001], Fernandez [2003] and Dudziński and Furmańczyk [2009], the theory of conditional extreme values has been used, while in an article by Wüthrich [2003] some application of Archimedean copulas in the calculation of the asymptotic VaR for sums of certain classes of dependent random variables has been depicted. Moreover, in Lusztyn [2013] the historic verification (backtesting) of VaR, obtained with use of some chosen econometric models applied to some data from the Polish stock, bond, interest rates and currency markets has been carried out. Finally, quite recently Furmańczyk [2016] generalized the method of VaR estimation introduced in the already cited paper of Wüthrich [2003] to the method in which no limit theorems had to be used.

Definition of the upper k -records

Before we introduce the notion of the upper k -records, we need to give the definitions of the k -th order statistics and record times. Let X_1, X_2, \dots, X_n be a sequence

of random variables that determines prices of the considered financial instrument in the given moments of time.

Definition 1. The k -th order statistic $X_{k:n}, k = 1, 2, \dots, n$, related to the random variables X_1, X_2, \dots, X_n , is a random variable which is a function of the random vector (X_1, X_2, \dots, X_n) , defined as follows: for any elementary event ω , we put a sequence of realizations: $X_1(\omega) = x_1, X_2(\omega) = x_2, \dots, X_n(\omega) = x_n$ in a non-decreasing order and obtain a sequence of the form: $x_{(1)} \leq x_{(2)} \leq \dots \leq x_{(k)} \leq \dots \leq x_{(n)}$; the k -th value in this sequence ($x_{(k)}$) is a realization of the random variable $X_{k:n}$, i.e. $X_{k:n}(\omega) = x_{(k)}$.

Definition 2. We determine the k -th upper record times $T^u(n, k)$ in the following manner:

$$T^u(1, k) := k, \quad T^u(n, k) = \min \left\{ j > T^u(n-1, k) : X_j > X_{T^u(n-1, k)-k+1 : T^u(n-1, k)} \right\} \quad (1)$$

This definition allows us to introduce the definition of the so-called upper k -records $U(n, k), n \geq 1$ [see also Dziubdziela and Kopociński 1976].

Definition 3. The upper k -records are determined as follows:

$$U(1, k) := X_{1:k}, \quad U(n, k) = X_{T^u(n, k)-k+1 : T^u(n, k)} \quad (2)$$

Remark: For $k = 1$, the upper k -record is an ordinary upper record (recall that X_j is an ordinary upper record if $X_j > X_i$ for all $j > i$).

Thus, the k -records provide the generalization of ordinary records. Practical application of ordinary records is limited due to the sparsity of these records. Indeed, it may namely be stated that the expected waiting time for every ordinary record is infinite after the first one and a sample of size n will only give $\log n$ records. This problem does not exist if we consider a sample of k -records instead [Ahmadi and Balakrishnan 2009].

VaR measure and quantiles

Assuming the continuity of distribution of the considered data, the VaR measure can be treated as an appropriate negative quantile of this distribution. In our investigations, we do not need to know the underlying distribution function F of distribution of the corresponding data, since we shall consider distribution-free confidence intervals for VaR, which means that the derivation of formulas on these intervals will not demand the knowledge of F .

In the present part of our paper, we wish to describe the relationship between the notion of quantile and the definition of VaR. This relationship is the starting point of our further study leading to the VaR measure estimation with use of the confidence intervals for quantiles, which are expressed in terms of k -records.

Definition 4. The quantile of rank $p \in (0; 1)$ of the probability distribution of a random variable Y with a distribution function F_Y , is a number $q \in R$ satisfying the following property:

$$P(Y < q) \leq p \leq P(Y \leq q) \quad (3)$$

If a random variable Y in the definition above is of a continuous type, then the quantile q of rank p is uniquely determined and given by the relation:

$$F_Y(q) = P(Y \leq q) = P(Y < q) = p \quad (4)$$

Formula (4) can be equivalently rewritten as $F_Y^{-1}(p) = q$, where F_Y^{-1} stands for the inverse function of the distribution function F_Y .

It can be checked that the concept of VaR is strictly associated with the notion of quantile. It shows the following definition.

Definition 5. Let: $X(t)$ denote the value of financial instrument in moment t , which generates a random gain or loss, α stand for a significance level, $1 - \alpha$ denote the confidence level. The Value at Risk measure for $X(t)$ on the confidence level $1 - \alpha$ (or the tolerance – significance – level α) is defined as [see Uniejewski 2004]:

$$\begin{aligned} VaR(1 - \alpha; t) &= -\inf\{x \in R : F_{X(t)}(x) > 1 - \alpha\} = \\ &= \sup\{-x \in R : F_{X(t)}(-x) < \alpha\} \end{aligned} \quad (5)$$

or equivalently as:

$$\begin{aligned} VaR(1 - \alpha; t) &= \inf\{x \in R : F_{-X(t)}(x) \geq \alpha\} = \\ &= -\sup\{x \in R : F_{X(t)}(x) \leq 1 - \alpha\} \end{aligned} \quad (6)$$

It may be easily seen that in the case when the distribution of $X(t)$ is of a continuous type, the relations above imply that

$$VaR(1 - \alpha; t) = -q_{1-\alpha}^{X(t)} \quad (7)$$

where: $-q_{1-\alpha}^{X(t)}$ denotes the quantile of rank $1 - \alpha$ of the distribution of $X(t)$.

Definition 5 means, for example, that if for the confidence level $1 - \alpha = 0.95$ (i.e., for the tolerance (significance) level $\alpha = 0.05$) the quantity of VaR equals PLN –10,000, then the probability of the event that in the time horizon $(0; t]$ the loss in value of the given financial asset will not exceed PLN 10,000 amounts to 0.95. In other words, we may say that with probability 0.05 the considered loss will not exceed the value of PLN 10,000.

Application of the upper k -records in construction of the distribution-free confidence intervals for quantiles

The result below illustrates a capability of application of the upper k -records in the determination of confidence intervals for quantiles. The obtained formula will be later used for the interval estimation of the VaR measure.

Theorem 1. Let $\{X_n, n \geq 1\}$ be a sequence of independent and identically distributed (iid) random variables with a distribution function F (thus, it is such that $F(x) = P(X_n \leq x)$ for any $n \geq 1$). Then, an interval $(U(i, k), U(j, k))$, $1 \leq i \leq j$, where $(U(n, k))$ denotes a sequence of the upper k -records, is a two-sided confidence interval for the population quantile $q_p = F^{-1}(p)$,

of rank $p \in (0; 1)$, whose confidence coefficient is free of F and determined by [Ahmadi and Balakrishnan 2009]:

$$\gamma(i, j; k, p) = (1 - p)^k \sum_{s=i}^{j-1} \frac{\{-k \log(1 - p)\}^s}{s!}, \quad (8)$$

where $\log(x) = \ln\{\max(x, e)\}$

The thesis of the assertion above means that:

$$P[U(i, k) \leq q_p \leq U(j, k)] = \gamma(i, j; k, p) \quad (9)$$

Let us notice that provided the rank of a quantile (p) and a desired level of confidence (γ_0) are specified, then the mentioned two-sided confidence interval for a quantile q_p exists on the condition that:

$$P[U(1, k) \leq q_p \leq U(n, k)] \geq \gamma_0 \quad (10)$$

for sufficiently large n

It may be shown that the last relation is equivalent to:

$$\max \gamma(i, j; k, p) = 1 - (1 - p)^k \geq \gamma_0, \quad (11)$$

where $\gamma(i, j; k, p)$ are such as in (8),

which implies the condition:

$$k \geq \frac{\log(1 - \gamma_0)}{\log(1 - p)} \quad (12)$$

We should emphasize that in construction of confidence intervals, we aim to find a confidence interval with a possibly minimal width. Thus, we seek such i, j , in the formula for a confidence level ($U(i, k), U(j, k)$), such that:

$$j - i \rightarrow \min, \text{ under the condition that } \gamma(i, j; k, p) \geq \gamma_0 \quad (13)$$

An algorithm that enables to determine i, j for which an interval ($U(i, k), U(j, k)$), reaches its minimal width is presented in the paper by Ahmadi and Balakrishnan [2009].

In Table 1, we placed optimal values of k, m and (i, j) , obtained on the basis of the mentioned algorithm, for $\gamma_0 = 0.95$ and some selected levels of p .

Table 1. Optimal values of k, m and (i, j) , for $\gamma_0 = 0.95$ and some chosen values of p

p	0,5	0,6	0,7	0,8	0,9
k_{opt}	5	4	3	3	2
m_{opt}	3	3	3	3	4
$(i, j)_{opt}$	(1,9)	(1,9)	(1,9)	(1,9)	(1,10)

Source: Ahmadi and Balakrishnan [2009].

EMPIRICAL STUDY

The basic inconvenience of our empirical research was the fact that our data, comprising of the share prices of PKO BP Bank, were not stochastically independent, whereas Theorem 1 can be used only if the considered observations are the realizations of independent random variables. In order to overcome this problem, we transformed a sequence of stock prices from our sample into a sequence of their logarithmic rates of return by acting as follows:

$$\ln\left(\frac{X(t)}{X(t-1)}\right), \quad t = 2, \dots, 300 \quad (14)$$

The corresponding time series, obtained from our original dataset through transformation (14), is depicted in the figure.

In order to check, whether our new sample of logarithmic rates of return comes from a sequence of independent random variables, we carried out the so-called Runs test. We conducted the Runs test with help of the R environment, in particular with use of the *runs.test* function, available after loading the *tseries* package of R. The p -value of the corresponding Runs test was equal to 0.4862 and exceeded the significance level 0.05. This means that, there is no reason to reject the null hypothesis that the logarithmic rates of return from our sample are the realizations of independent random variables.

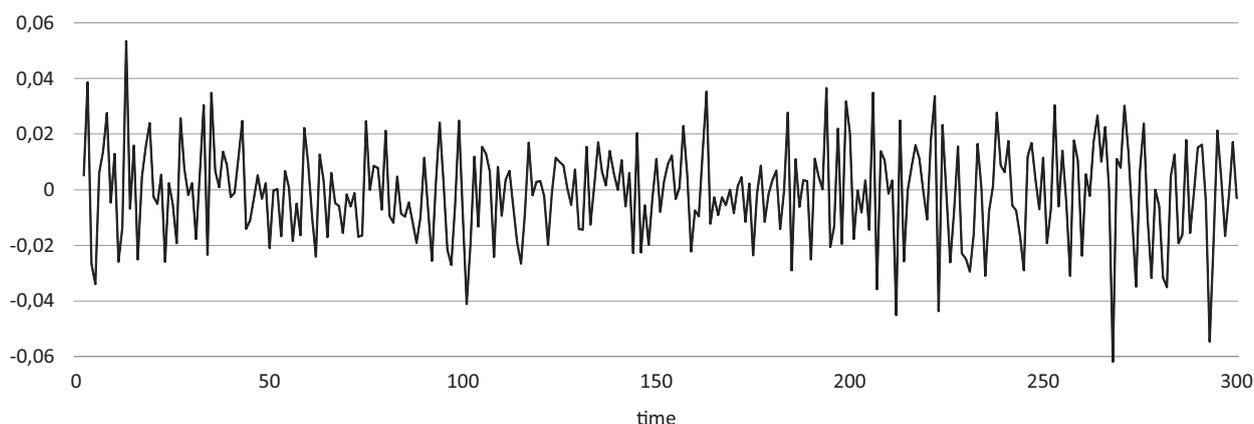


Fig. Time series of logarithmic rates of return of the share prices of PKO BP Bank from the period 13.01.2017–22.03.2018

Source: Own elaboration.

As, in view of the conducted Runs test, we may assume that the calculated logarithmic rates of return of the share prices of PKO BP Bank in the period 13.01.2017–22.03.2018 are the realizations of some sequence of independent random variables, we may apply Theorem 1 in order to determine the confidence intervals for quantiles of the distribution of logarithmic rates of return of the considered stock prices. For this purpose, we provided a table containing the values of the upper k -records ($U(n, k)$) for our sample of logarithmic rates of return and some selected $k \in \{2, 3, 4, 5\}$.

Based on the values of the upper k -records listed in Table 2, we obtained the realizations of confidence intervals for the quantiles of rank p of the logarithmic rates of return of the share prices of PKO BP Bank in the selected time horizon.

In particular, it may be seen from Table 3 below that the quantile of rate 0.9 of the considered logarithmic rates of return is with probability 0.951 a certain value from the interval $(-0.033918; 0.027558)$ ¹. It means that with probability 0.9, on average in 95 out of 100 days, the value of daily logarithmic rate of return belongs to the interval $(-0.033918; 0.027558)$.

Thus, we may write that with probability 0.951:

$$F_{Y_t}^{-1}(0.9) \in (-0.033918; 0.027558),$$

$$\text{where } Y_t = \ln\left(\frac{X(t)}{X(t-1)}\right), \quad t = 2, \dots, 300. \quad (15)$$

Due to (15), we have with probability 0.951 that:

$$P\left(\ln\left(\frac{X(t)}{X(t-1)}\right) \leq q\right) = 0.9 \quad (16)$$

for some $q \in (-0.033918; 0.027558)$,
 $t = 2, \dots, 300$,

and consequently that:

$$P\left(\frac{X(t)}{X(t-1)} \leq q\right) = 0.9 \quad (17)$$

for some
 $q \in [\exp(-0.033918); \exp(0.027558)]$.

¹ Logarithmic rate of return is a unitless quantity and it can take an arbitrary real value. Furthermore, it is positive if there is a growth in share prices and negative if otherwise.

Table 2. Values of the upper k -records for the logarithmic rates of return of PKO BP Bank in the period 13.01.2017–22.03.2018

n	k			
	2	3	4	5
1	0.005149	-0.026706	-0.033918	-0.033918
2	0.005982	0.005149	-0.02671	-0.026710
3	0.013821	0.005982	0.005149	0.005149
4	0.027558	0.013821	0.005982	0.005982
5	0.038619	0.027558	0.012851	0.012851
6	–	0.030326	0.013821	0.013821
7	–	0.034828	0.01584	0.015678
8	–	0.035216	0.02386	0.01584
9	–	0.036378	0.025645	0.02386
10	–	–	0.027558	0.025645
11	–	–	0.030326	0.027558
12	–	–	0.034828	0.030326
13	–	–	0.035216	0.034828
14	–	–	–	0.034837

Source: Own elaboration.

Table 3. The realizations of confidence intervals for quantiles of the logarithmic rates of return of the share prices of PKO BP Bank from the period 13.01.2017–22.03.2018, expressed in terms of the upper k -records with a confidence coefficient $\gamma \geq 0.95$

p	k	$(U_{i,k}; U_{j,k})$	$\gamma = \gamma(i, j; k, p)$
0.9	4	$(U_{1,k}; U_{10,k}) = (-0.033918; 0.027558)$	0.951
0.8	3	$(U_{1,k}; U_{9,k}) = (-0.026706; 0.036378)$	0.954
0.7	3	$(U_{1,k}; U_{9,k}) = (-0.026706; 0.036378)$	0.961
0.6	4	$(U_{1,k}; U_{9,k}) = (-0.026706; 0.036378)$	0.961
0.5	5	$(U_{1,k}; U_{9,k}) = (-0.033918; 0.023860)$	0.959

Source: Own elaboration.

Hence, with probability 0.951:

$$P\left(\frac{X(t)}{X(t-1)} \leq q\right) = P[X(t) \leq X(t-1)q] = 0.9 \quad (18)$$

for some $q \in (0.967; 1.028)$

Putting into a place of random variable $X(t-1)$ in (18) its realization $x(t-1)$ (which is an appropriate historical value from our data), we may write that with probability 0.951:

$$P[X(t) \leq x(t-1)q] = 0.9 \quad (19)$$

for some $q \in (0.967; 1.028)$

Thus, we obtain that with probability 0.951 the value $x(t-1)q$, where q denotes some number from the interval (0.967; 1.028), is the quantile of rank 0.9 of the distribution of $X(t)$. The relations in (7) and (19) imply that $VaR(t)$, i.e. a desired VaR for the share prices of PKO BP Bank in the considered period, is with probability 0.951 given by:

$$\begin{aligned} VaR(t) &= -x(t-1)q \\ &\text{for some } q \in (0.967; 1.028) \end{aligned} \quad (20)$$

The equality above implies that with confidence 95.1%, we may claim that probability of the event that the loss in stock prices in a time horizon (0; t] will not exceed $x(t-1)q$ (PLN), where q stands for a (unitless) number from the interval (0.967; 1.028), is equal to 0.9.

In case of the considered share prices of PKO BP Bank, we have that $x(t-1) = \text{PLN } 29.96$ for $t = 300$. Thus, we may state, with confidence 95.1%, that with probability 0.9 the value of loss will not exceed a certain number from the interval (PLN $29.96 \cdot 0.967$; PLN $29.96 \cdot 1.028$) = (PLN 28.97; 30.80). In other words, on average within 95 out of 100 days, probability of the event that the value of potential loss will not exceed some number between PLN 28.97 and 30.80 is equal to 0.9. Relating the level of loss to an average price of the given financial tool, it is possible to quantify the risk level of investor. In our study, an average share price of PKO BP Bank in the assumed time period amounted to PLN 37.33 and its median to PLN 35.85. It means that, on average, during 95 out of 100 days, we may say that, with probability 0.9, the corresponding loss will not exceed a percentage from the range between 77.6 and 82.5% of the prices arithmetic mean, as well as it will not exceed a percentage from the range between 80.8 and 85.9% of the prices median. Such a rather large percentage contribution of the VaR measure both with relation to the mean price and with relation to its median gives an evidence that the financial risk of investing in the PKO BP Bank stocks is relatively high.

It is important to underline that the proposed approach is a method of interval estimation, which allows to establish lower and upper limits of the potential loss with a fixed confidence coefficient. This is not possible in case of the point estimation, where we only determine one specified value of estimator.

SUMMARY

Value at Risk is widely recommended by various authorities of financial control as a tool of measurement of the potential financial loss that may be incurred by banks and other financial institutions due to their operational activities. The correct estimation of the VaR measure is relevant, as its precise evaluation may have a substantial impact on the process of efficient use of the gathered capital and may even influence solvency of banks and other financial institutions.

In our work, we proposed the method of interval estimation of the VaR measure that used the notion of the upper k -records. Its application resulted in the conclusion that with confidence level 95.1% (i.e. on average, in 95 out of 100 days) and with probability 0.9 the potential loss of investing in the considered stocks will not exceed some value from the interval (PLN 28.97; 30.80). With regard to an average share price and its median, it may be interpreted that the corresponding loss will not exceed the range (77.6; 82.5%) of the average stock price and will not exceed the range (80.8; 85.9%) of the stock price median. The conducted research indicates that the risk of investing in the given shares is relatively high.

Although we have not conducted any comparisons between the proposed method of estimation and other approaches, it is worthwhile to mention that the presented method of VaR evaluation provides a non-parametric, distribution-free approach, which in addition does not require neither imposing on any normality or consistency assumptions nor employing big datasets. Furthermore, this method is easy for calculation and interpretation. Thus, we obtain attractive and plausible estimation procedure that stands out from many other existing methods of risk estimation in the sense of its feasibility and computational tractability.

Obviously, it would be interesting to compare risk obtained with use of the proposed approach for the PKO BP Bank with identically calculated risks for some other banking institutions, as well as to compare the presented method of risk estimation with some other distribution-free methods of its evaluation. However, such a comparative analysis goes beyond the scope of our paper. Simultaneously, it should be emphasized that the mentioned comparisons are necessary in the further research devoted to banking risk management.

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ZASTOSOWANIE k -TYCH REKORDÓW W ESTYMACJI PRZEDZIAŁOWEJ WARTOŚCI ZAGROŻONEJ RYZYKIEM (VaR)

STRESZCZENIE

Wartość zagrożona ryzykiem, lub krócej – wartość zagrożona (Value at Risk, VaR), jest podstawowym narzędziem wykorzystywanym zarówno w procesach zarządzania ryzykiem banków i innych instytucji finansowych, jak i w zadaniach związanych z jego nadzorem i kontrolą. Miarę VaR można interpretować jako minimalną wartość kapitału, którą dany podmiot powinien posiadać w formie zabezpieczenia na poczet ewentualnych strat. Choć metod szacowania wartości zagrożonej jest wiele, dotychczas nie wskazano uniwersalnej i pozbawionej wad metody jej kalkulacji. W niniejszej pracy zaproponowano oraz przedstawiono możliwość oszacowania miary VaR za pomocą przedziałów ufności wyrażonych w terminach tzw. k -tych rekordów. Zaproponowaną metodę zilustrowano na przykładzie Banku PKO BP. Wyznaczono realizacje przedziałów ufności dla wartości zagrożonej na podstawie danych dotyczących notowań cen akcji banku w okresie od 13.01.2017 r. do 22.03.2018 r.

Słowa kluczowe: miary ryzyka, wartość zagrożona, k -te rekordy, kwantyle, estymacja przedziałowa

WAGE CONVERGENCE ON THE COUNTY-LEVEL IN POLAND: A PANEL DATA APPROACH

Ewa Ferens  

Warsaw University of Life Sciences – SGGW

ABSTRACT

This study investigates nominal wage convergence on the county level in Poland from 2005 till 2017, while accounting for the structural heterogeneity of the units and common time shocks. Results reveal that wage levels converge to their own steady-state with the speed of 7.6% of the imbalance per year. When time fixed effects are accounted for, this speed becomes higher and has a value of 34.5%. Common time effects, such as economic cycle considerably contribute to the convergence speed. The exclusion of time effects tends to bias downward the estimated convergence rate. With regard to σ -convergence, wage inequalities across the counties decreased over the years 2005–2010 with their levels moving toward the national average. However, as of 2010 this process, if any, is very slow.

Key words: wage convergence, wage disparities, β -convergence process

INTRODUCTION

Reducing regional disparities is a major issue of European Union policies. Since joining EU in 2004, Poland has been under European Single Market policy, targeting the free movement of people, goods, and services. The free market provides conditions for factor price equalization by enabling reallocation of resources. In case of labour market this happens through a change in demand and supply of labour what, in turn, influences their prices, i.e. wages. Furthermore, reduction in wage differences might be a signal of their convergence. Absent convergence of wages can result in further divergence of real living standards.

Empirical evidences for Poland consistently report considerable interregional wage disparities and lack of convergence with a persistent gap between

western and eastern Poland and between the Mazowieckie region and the rest of the country [Rogut and Tokarski 2007, Misiak et al. 2011, Zieliński 2011, Ferens 2015, Vera et al. 2016]. Some studies indicate wage convergence process among counties but without accounting for structural differences between the units [Adamczyk 2016].

The aim of this study is to examine nominal wage convergence on the county level in Poland in the years 2005–2017. In order to correct the bias generated by omitted variables and heterogeneity in the classical cross-sectional regression, it is suitable to introduce panel data approach which allow for specific differences across economies, by modelling the unit specific effect [Mankiw et al. 1992, Islam 2003]. Therefore, the empirical analysis in this paper is based on a panel data set for 380 Polish counties for the time span of 13 years and the wage convergence

is examined, while taking into account the heterogeneity of the researched counties. The tested hypothesis assumes that wage convergence on the county level in Poland occurs when some county-specific structural characteristics (such as different resource endowments, infrastructure, demographic characteristic, migration rates, human capital, employment rate etc.) are under consideration. Three important questions are addressed in this study. First, is there wage convergence on the county level in Poland? Second, do these wage levels converge to their own long term growth trajectory (own steady-state)? Third, to what extent common time specific shocks, such as economic cycle, influence the speed of potential wage convergence?

The rest of the paper is structured as follows: the next section offers a brief review of relevant theory, followed by a short description of wage inequalities among Polish counties, next data and estimation method are described, and further results are reported. The last section concludes the study.

THEORETICAL BACKGROUND OF WAGE CONVERGENCE

The concept of convergence in the most general sense is the decreasing or equalising of disparities. The neoclassical paradigm hypothesizes that if information is perfect, and labour and capital can move freely, nominal wages of labour with similar human capital characteristics will equalize across regions. However, many empirical evidences do not confirm this assumption, indicating persistent regional wage disparities. Therefore, some alternative theories have been put forward, such as the amenity theory, the efficiency wage hypothesis, the bargaining theory or the new economic geography (NEG) theory.

In order to explain wage differentials, some authors [Rosen 1986, Roback 1988, Gyourko and Tracy 1989] extended the neoclassical approach by taking into account a variety of non-wage factors affecting the location decision of labour and companies. These unique factors, named as “amenities”, may include family considerations, climate, environment, transportation networks, infrastructure, avail-

ability and quality of public services, etc. If workers consider both wage factors and amenities in order to maximize their overall utility, wages will not necessarily be equalized across regions even in the free market.

Next, the efficiency wage hypothesis holds that, in some markets, employees with identical productive characteristics might receive different wages if companies pay premiums to increase their efficiency and to minimize costs associated with rotation, in industries where the costs of replacing labour are high.

Another approach is the bargaining theory of wages assuming that wages are determined by the relative bargaining power of the parties to the agreement. Therefore, there is a range of wage rates, any of which may exist simultaneously. These rates can be influenced by numerous factors, including the productivity of the workers, the competitive situation, the size and type of the investment, and the employer’s prognosis of future business conditions.

Finally, NEG assumes that the agglomeration of human capital creates regional clusters of high-skilled employees generating knowledge spillovers that increase productivity and efficiency and allow for higher wages. Moreover, economic agglomeration may generate congestion costs, and companies in agglomerated areas must pay workers higher nominal wages [Vera et al. 2016].

The widely used way of testing convergence hypothesis is β -convergence analysis that arises from the neoclassical theory of the economic growth. β -convergence reflects a negative association between the growth rates of a variable and the initial values of that particular variable. *Ceteris paribus*, the parameter β on the lagged dependent variable is expected to be negative. Within a neoclassical approach, it is because diminishing returns to scale imply that out of a steady state, regions with low capital intensity will grow faster than those with high intensity, *ceteris paribus* [Ostrybe and Westerlund 2007]. Following a Cobb–Douglas production function [Barro and Sala-i-Martin 1992, Sala-i-Martin 1996], cross-region growth regression, without accounting for growth determinants, may be expressed as:

$$\gamma_i = \beta \ln(y_{i,0}) + \varepsilon_i \quad (1)$$

where:

- γ_i – growth rate of economy;
- $y_{i,0}$ – initial level of per capita income;
- ε_i – error term.

Following equation 1, an absolute β -convergence equation can be expressed in levels as follows:

$$\ln(y_{i,t_0+T}) = \theta + (1 + \beta T) \ln(y_{i,t_0}) + \varepsilon_{it} \quad (2)$$

where:

- y_i – income per capita in economy i ,
- t_0 – initial years in the data;
- t_{0+1} – final years in the data;
- T – number of years minus one;
- θ – constant;
- $1 + \beta T = e^{-bT}$ with $b > 0$ – convergence speed;
- ε_{it} – error term.

The unconditional β -convergence occurs when the sign of the coefficient β is negative.

Wage convergence is actually a part of a total convergence. β -convergence is said to exist if growth rates of wages are negatively correlated with the initial values of wages for each economy. Thus, lower-wage units grow faster than higher-wage units and in the long-run their labour markets tend to converge toward the same average wage. This approach assumes that wages converge toward a single steady state regardless of the initial endowments of different factors specific for particular economies.

In this study the conditional β -convergence hypothesis is tested, which takes place when, after adding other variables to equation 1 or 2, the coefficient β becomes negative [Barro and Sala-i-Martin 1992]. The fundamental idea behind conditional convergence is that growth disparities are not permanent only because of differences in initial values of some specific variable, e.g. wages but also due to other unit specific factors, such as different resource endowments, infrastructure, institutions, migration rates, or human capital differences. In the regression

equations, each of these factors can be a “conditioning” variable.

Since β -convergence does not give a clear answer about distribution of wage differences across economies over time, it is useful to test σ -convergence, suggested by Quah [1993]. This concept is also derived from the neoclassical theory of the economic growth, according to which regions are headed towards the same steady and homogenous state in the future. σ -wage convergence occurs if over time the dispersion of wages across economies, measured by the standard deviation or variance, becomes more equitable. This indicates that wage levels move toward the national average. It should be noted that β -convergence is a necessary condition for σ -convergence to occur [Sala-i-Martin 1996] but does not necessarily imply a reduction in variation of wage levels over time.

WAGE DISPARITIES ON THE COUNTY LEVEL IN POLAND

This section provides a brief overview of wage disparities across Polish counties. Figure 1 illustrates average monthly nominal wages in the counties in 2005. Wage disparities were significant with numbers oscillating between PLN 1,470 and 4,408. The highest wages featured the units with mining industry, cities with county rights, or units located close to big cities. In this group, nine units indicated monthly wages over PLN 3,000 (Lubiński, Jastrzebie-Zdrój, Warszawa, Łęczyński, Katowice, Bełchatowski, Pruszkowski, Gdański, Płock). The lowest wages, instead, could be observed in the outlying areas, with 175 counties with pays below PLN 2,000.

Figure 2 shows the rate of wage growth in 2017 in comparison to 2005. The greatest growth numbers were in five counties (Poddębicki, Wołowski, Piekary Śląskie, Hajnowski, Bielski) where wages rose more than 114%. Looking at Figures 1 and 2 together gives an overall picture that counties with the lowest wages in the initial year performed very well with regard to the growth rate in the final year. In this group, 67 counties demonstrated growth rate over 94%.

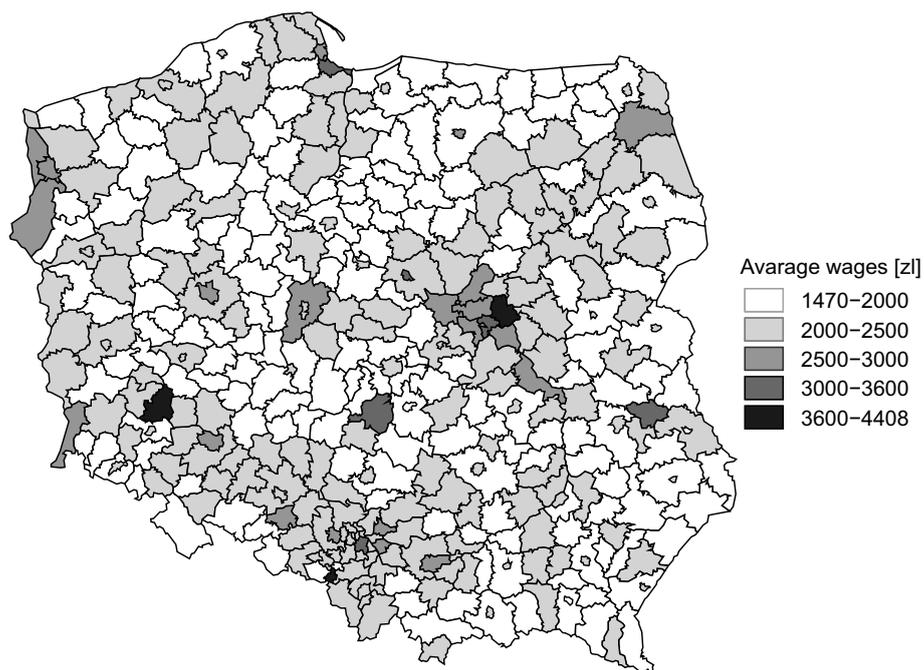


Fig. 1. Average monthly nominal wages in Polish counties in 2005

Source: Own elaboration.

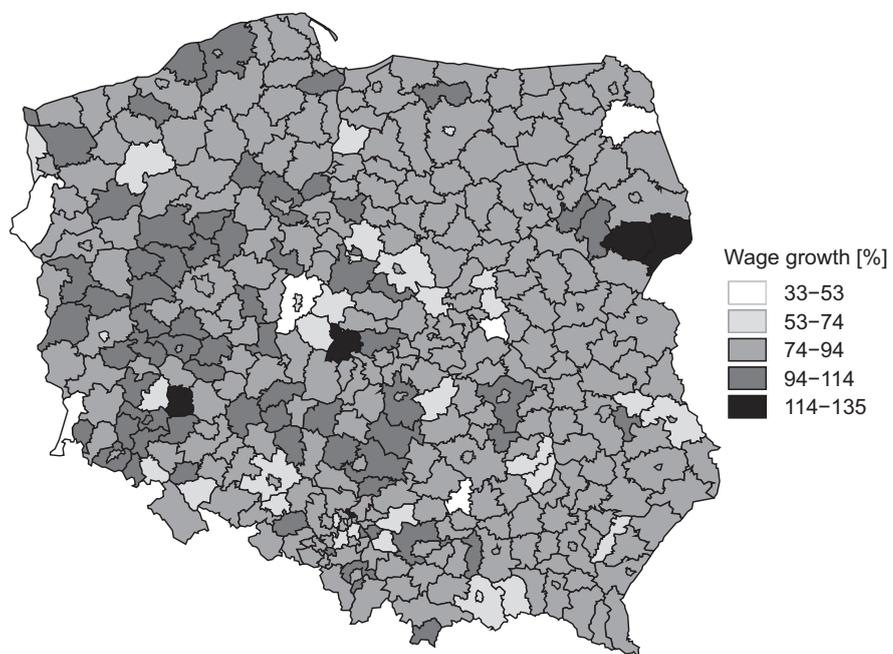


Fig. 2. Growth rate of average monthly nominal wages in Polish counties in 2017 (base year = 2005)

Source: Own elaboration.

DATA AND ESTIMATION METHOD

In this study, wage convergence is analysed by introducing a panel data approach. The panel contains 4,940 observations with annual data for 380 Polish counties (NUTS 4) over the period 2005–2017. All data are collected from the Central Statistical Office of Poland (GUS). Wages are expressed by average monthly nominal gross wages¹ in the county. Table 1 reports descriptive statistics of wage variable denoted as W .

Taking up the equation 2, an absolute β -convergence of wages can be formulated as follows:

$$\ln(W_{i,0+T}) = \theta + (1 + \beta T) \ln(W_{i,0}) + \varepsilon_{it} \quad (3)$$

where:

- W_i – average wages in county i ;
- t_0 – initial years in the data;
- t_{0+T} – final years in the data;
- T – number of years minus one;
- θ – constant;
- $1 + \beta T = e^{-bT}$ with b – convergence speed;
- ε_{it} – error term.

In order to correct the bias generated by omitted variables and to allow for county specific differences and for time specific shocks equation 3 is reformulated as a panel fixed-effect regression:

$$\ln(W_{it}) = \theta + (1 + \beta) \ln(W_{i(t-1)}) + \alpha_i + \alpha_t + \varepsilon_{it} \quad (4)$$

where:

- t – time periods in the data;
- α_i – time invariant county specific effects that reflects all those omitted variables that influence the wage growth process;
- α_t – sets of year effects that control common time specific shocks (such as common economic cycle effects) to all counties.

It should be noted that convergence is a process that is likely to occur in the long run. Thus, one year time span can capture random adjustment towards the trend. However, including the wage growth rate over a longer time period would mean less time observations in the analysis. Moreover, the objective of this research is to examine the wage convergence at county level while considering local heterogeneities and the influence of time shocks. For this reason, the dependent variable is defined in terms of annual growth rate.

Further, based on β value, the half-life of the convergence process (hl) is computed (eq. 5) which is defined as the number of years necessary for current wage inequalities to be halved [Ben-David 1996].

$$hl = \frac{-\ln(2)}{\ln\left(1 + \frac{\beta}{T}\right)} \quad (5)$$

In the last step σ -convergence process is measured by the standard deviation as follows:

$$\sigma_i = \sqrt{\frac{\sum_{i=1}^N (\ln W_{it} - \ln \bar{W}_t)^2}{N}} \quad (6)$$

where:

- N – number of counties;
- W_{it} – average monthly wage in county i in year t .

RESULTS

The outcomes of the β -wage convergence estimation are reported in Table 2. County fixed effects are included in both columns, whereas time effects only in the last column.

In case of both estimations, parameter β is negative and statistically significant indicating wage con-

Table 1. Descriptive statistics of wage variable

Variable	AVG	Mdn	Max	Min	SD
Wages (W)	3 002.86	2 988.52	7 515.99	1 470.09	669.53

Wages in PLN.

Source: Own elaboration.

¹ Excluding economic entities employing up to 9 persons.

Table 2. Results of wage convergence estimation

Parameter	Panel regression	
	without time effects	with time effects
$\ln(W_{-1})$	0.926*** (0.002)	0.708*** (0.010)
β	-0.074*** (0.002)	-0.29*** (0.083)
Convergence speed	0.076	0.345
Intercept	0.634	2.373
Half-life (<i>hl</i>)	9.07	1.99
County specific effects (α_i)	yes	yes
Time effects (α_t)	no	yes
Total panel observations	380	380
Observations per county	12	12
Adj. R^2	0.98	0.99
F-statistics	796.58***	1 390.13***
Durbin–Watson statistics	2.09	2.07

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Source: Own elaboration.

vergence process. When only time-invariant county-specific factors are included, the estimated convergence rate is 0.076, meaning the counties converge towards their own steady state with the speed of 7.6% of their imbalance per year. This result, while in principle suggesting convergence, implies that this process is slow and the time necessary for the economies

to cover half of the initial lag from their steady states is around 9 years. Nevertheless, when additionally conditioned on common time specific shocks, convergence speed becomes considerably faster, and is 34.5% of the imbalance per year, corresponding to half-life of around 2 years only. Next, σ -wage convergence is examined. Figure 3 illustrates dispersion

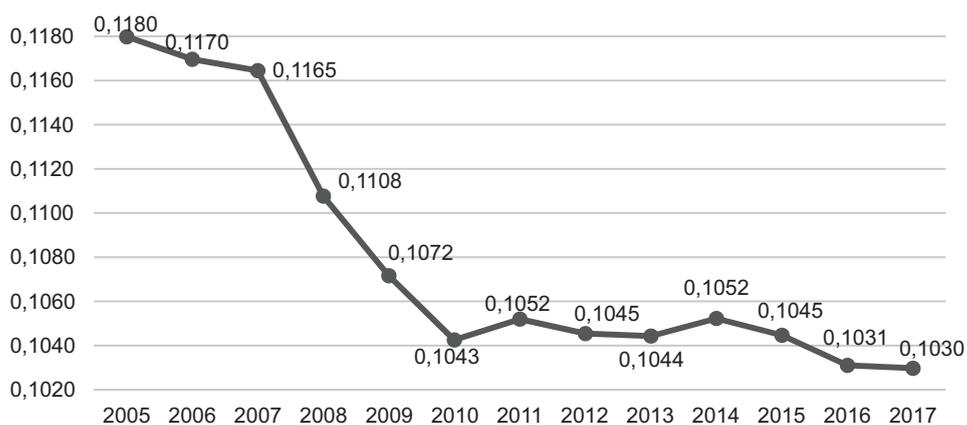


Fig. 3. Wage σ -convergence among Polish counties in the years 2005–2017

Source: Own elaboration.

of standard deviation of wages over the years 2005–2017. At first glance, diminishing values of standard deviation confirm σ -convergence process. However, a clear decline in wage inequalities across the counties can be observed only in the years 2005–2010. As of 2010 this process is very slow, showing slight fluctuations.

CONCLUSIONS

The aim of this study is to investigate nominal wage convergence on the county level in Poland in the years 2005–2017, while accounting for structural heterogeneity of the units. This heterogeneity can result from differences in resource endowments, demographic characteristic, migration rate, human capital, etc.

In contrast to existing empirical evidences for Poland suggesting lack of wage convergence on the regional level, the results of this study confirm the hypothesis of conditional β -convergence of wages on the county level. In other words, wage levels across counties converge to their own steady-state. Calculated speed of the convergence is 7.6% of the imbalance per year, meaning that this process is very slow and the time necessary for the current wage inequalities to be halved is around 9 years.

Another interesting finding is that when common time fixed effects are accounted for, convergence speed becomes significantly higher. In a general sense, when time effects are added to the set of independent variables in the regression, it means they are kept constant and are ignored as a potential source of convergence. When time effects are excluded from the equation, their effect is allowed to influence the speed of the convergence. Results reveal that rate of convergence increases from 7.6 to 34.5% of the imbalance per year after keeping time effects constant in the equation. Therefore, it can be concluded that common time shocks, such as economic cycle or political changes considerably contribute to the estimation of wage convergence rate. The exclusion of time effects tends to bias downward the estimated convergence speed, especially when there are no other time-invariant explanatory variables in the equation.

With regard to σ -convergence, the results confirm that wage inequalities across the counties decreased over the years 2005–2010 with their levels moving toward the national average. However, as of 2010 this process, if any, is very slow.

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KONWERGENCJA WYNAGRODZEŃ NA POZIOMIE POWIATÓW W POLSCE: PODEJŚCIE PANELOWE

STRESZCZENIE

W artykule zbadano konwergencję wynagrodzeń nominalnych na poziomie powiatów w Polsce w latach 2005–2017, biorąc pod uwagę ich strukturalną heterogeniczność i wpływ wspólnych efektów czasowych, takich jak cykl koniunkturalny. Wyniki wskazują, że na poziomie powiatów zachodził proces konwergencji warunkowej wynagrodzeń, a jego szybkość wyniosła 7,6% nierównowagi rocznie. Po uwzględnieniu efektów czasowych, szybkość konwergencji wzrosła do 34,5% nierównowagi rocznie. Odnośnie σ -konwergencji stwierdzono, że nierówności w wynagrodzeniach zmniejszyły się głównie w latach 2005–2010. Od 2010 roku proces ten zachodzi w minimalnym stopniu.

Słowa kluczowe: konwergencja wynagrodzeń, nierówności wynagrodzeń, β -konwergencja

INNOVATIONS IN THE FOODSERVICE BUSINESS IN LARGE POLISH CITIES

Edyta Gheribi¹  , Gultekin Altuntas² , Alessandro Bonadonna³ 

¹ University of Łódź

² Istanbul University

³ University of Turin

ABSTRACT

Innovation plays an important role enabling businesses to retain their competitiveness ensuring their long-term survival on dynamic markets. This article presents innovations in terms of an offer (product/services) and/or organizational/marketing process in the foodservice businesses as a competitive factor. The study was carried out using a qualitative, constructivist perspective and a quantitative research method from January to November 2017. Entrepreneurs working in Poland in the foodservice businesses were interviewed as were individual foodservice businesses in Warsaw and Łódź. A total of 70 businesses were studied, 5 chain services and 65 individual restaurants, 40 in Warsaw and 25 in Łódź.

Key words: innovation, strategy, management, competitiveness

INTRODUCTION

The foodservice industry combines art and traditions, has different operational mechanisms and requires a service philosophy that takes advantage of experience in marketing based on the concept of the formation of the potential audience. Data have shown that the foodservice industry is one of the most vigorous industries in the Polish economy and that significant improvements have been made in the conditions of food preparation and consumption. The development of the foodservice industry undoubtedly goes hand-in-hand with the social and economic changes that have recently taken place in Poland [Gheribi 2013b, Gheribi and Voytovych 2018]. The lifestyles of various high and low income socio-economic groups have changed a great deal [Gheribi 2013a]. The foodservice industry is very sensitive to economic and social trends, such as rising food prices, changes in customers' spending

due to household incomes and customers' behaviors as a result of promotion for healthy eating pro-healthy campaigns [Kwiatkowska and Levytska 2007, Gheribi 2015]. Recent trends in the foodservice business are elusive as this type of activity is in evolution, leading to the creation of more specific services, such as fusion cooking or an emphasis on traditional dishes. Indeed, the competition created by the foodservices offered encourages business owners to develop a more attractive style.

Innovation in this field can be defined as a new or novel approach to the business, product, process or service changes in the business [Palmer and Griswold 2011] and is an important aspect of contemporary food businesses. Moreover, it can be a strategic problem-solving tool able to meet new requirements and can be defined as incremental or radical, where the incremental element is more popular as the customer tends to have set food habits [Rama 1996, Traill and

Edyta Gheribi  <https://orcid.org/0000-0001-7626-7578>; Gultekin Altuntas  <https://orcid.org/0000-0002-7205-3289>; Alessandro Bonadonna  <https://orcid.org/0000-0003-1866-7359>

 edyta_kwiatkowska@interia.eu

Meulenberg 2002, Capitanio et al. 2009, Arcese et al. 2015, Boccia and Covino 2016]. For example, in some cases tradition is also considered a kind of innovation: it is a strategic key for the food sector to change its future [DeSoucey 2010, Bonadonna et al. 2017a, b] aimed at increasing value, e.g. foodstuffs [Jordana 2000, Dogan and Gokovali 2012], specific foods [Schamel 2007, Bonadonna and Duglio 2016, Marcoz et al. 2016] and, of course, in the foodservice business [Mkono 2012, Gordin et al. 2016, Maltese et al. 2016].

On the basis of aforementioned observations, this article aims to show innovations in terms of an offer (product/services) or and organizational/marketing process in foodservice businesses and is presented as a factor constituting the competitiveness of foodservice business.

MATERIAL AND METHODS

The study was carried out from January to November 2017, using a qualitative, constructivist perspective. A total of 70 restaurateurs from Warsaw and Łódź as either an individual businessperson or a professional employed in domestic or foreign chains in operation in Poland were interviewed. Five belonging to chains, 65 were individual foodservice businesses, 40 of who were in Warsaw and 25 of who were in Łódź. Most of these asked to remain anonymous, therefore their names are not mentioned.

The interview was carried out by a semi-structured method using a questionnaire with the PAPI technique (paper and pencil interviewing). The order of the questions changed depending on who was being interviewed in a way that Bernard [1988] recommended.

The authors analyzed the interview results in two steps i.e. they evaluated them individually and, then, shared and compared individual evaluation.

In own study, 64% (45 businesses) of the surveyed businesses are classified as microbusinesses while 29% (20 businesses) are regarded as small business. The remaining 7% (5 businesses) were considered as medium businesses (Fig. 1).

RESULTS AND DISCUSSION

The main indicators characterizing the development of the foodservice industry is the number of businesses and their revenues generated in Poland. According to Central Statistical Office of Poland, in terms of number, there were 69,195 foodservice businesses including 20,018 restaurant establishments in 2016 with a gradual increase of 134.97% from the year 2000 to 2016. In regard to the revenue generated in the foodservice industry, it comes mainly from own food production (85.35%) and is followed by alcohol and tobacco sales.

In the study areas, the number of restaurants and foodservice businesses have increased from 2005 to 2015. According to Central Statistical Office of Poland, in Warsaw, the rates of increase in the number of restaurants and total foodservice businesses were 84.75 and 67.98% respectively in the city whereas 82.52 and 50.8% in the voivodship. In terms of Łódź, they were 88.57 and 81.71% in the voivodship.

Strong competition and rapid changes in customer's preferences and expectations in the foodservice industry encourage owners in foodservice to develop not just the basic strategy and style of running foodservice operations, but also think through the details, which will add to the uniqueness and eccentricity of the enterprise. However, most retail businesses miss the chances to gain and/or retain competitive advantages since they start their businesses with a traditional retail approach, due to the invisibility of those market changes. Businesses which miss these opportunities

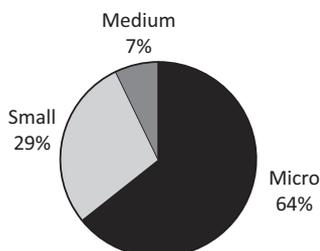


Fig. 1. Characteristics of the study of foodservice companies

Source: Calculations on the own research.

often face a decrease in market share resulting in a decline in number of both regular and non-regular customers, a slow speed turnover, smaller profit, further economic disadvantages and low service quality, which it usually turns to be a beginning of the end for that particular business in the long-run. However, in today's world, the best business opportunities will belong to those who can come up with new and better business ideas, ways to create, deliver and then capture value, which can be a definition of innovation. With a focus on customers as a modern approach on the other hand, more proactive market oriented companies can benefit from adaptive concepts and well-timed business decisions. In addition, in being able to recognize a favorable course in the market, businesses will be able to retain their market position, can react and make changes. Modern consumers and their constantly changing habits require a prompt response and service tailored according to their needs.

Customers expect a steady increase in quality, safety and diversity of food. The trend towards eating healthier in recent years has increased consumer demand for more detailed, accurate and accessible information, principally on food package labels, and covering nutritional content, ingredients and claims, as well as aspects relating to food safety, such as expiry dates, storage and cooking instructions [European Commission 2015a, b].

Understanding customer behavior and the impact of food on health, and well-being is a major factor in the competitiveness of both the food industry and also foodservice industry. With a perspective in hand, the focus should be placed on customers' perception and attitudes towards food, understanding of societal trends, and identification of food choice determinants and customers' access to food. Within the foodservice context, innovations are referred to as an idea, practice, process or product which puts into practice ideas that solve problems and are perceived as new by the consumers [Ottenbacher and Gnoth 2005].

Foodservice businesses often make significant efforts to innovate their business activities, organizational processes, products and services in order to achieve revenue and market share growth. As aforementioned, innovation has been defined in the foodservice business by Palmer and Griswold [2011]. The literature

suggests that innovation represents a mechanism by which enterprises in the hospitality industry including restaurant business can improve quality and reputation, cut costs and increase sales and profits [Ottenbacher and Gnoth 2005]. Innovation processes in foodservice have been shown to reduce the propensity for failure in an industry, which typically has high levels of competition [Parsa et al. 2005]. New foodservice products and services can generally be quickly copied by competitors. Innovation helps foodservice businesses stay ahead of the competition resulting in the establishment of a long term competitive advantage [Ottenbacher and Harrington 2007]. Since the restaurant industry is highly competitive, their confidence in their abilities, for example, to develop new product and market opportunities and build an innovative environment could be crucial in determining the level of innovation in their business and their motivation to work hard to be successful [Assaf et al. 2011]. In Poland also can see that the restaurant industry grew rapidly and is highly competitive especially in big cities [Gheribi 2017]. There is no question whether restaurants are innovating but are they moving fast enough to stay relevant in the face of evolving consumers' tastes and preferences.

RESEARCH FINDINGS

Foodservice businesses can make many types of changes in their methods of work, use of factors of production and types of output to improve their productivity and/or organizational performance. Innovation in a restaurant business can be achieved in many ways, mainly by adding novel activities, linking activities in novel ways and changing one or more parties that perform any of the activities. Thus, this study adopts the Organization for Economic Co-operation and Development (OECD) typology which categorizes innovations as [Hall 2009] product/service, process, organizational/managerial and marketing innovations.

In own study, 76% of the companies surveyed considered that they are innovative companies, 20% considered that they are not innovative and 4% companies do not know whether they are innovative or not (Fig. 2).

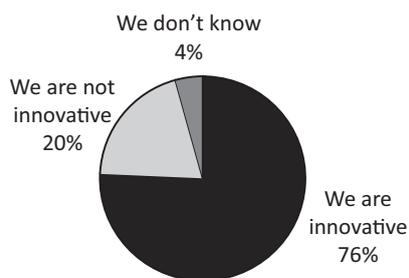


Fig. 2. To be innovative in the opinion of the respondents
Source: Calculations on the own research.

Interviewed participants of the survey are asked to define innovation in five ways: to create something new (52 enterprises), to improve (30 enterprises), to create something different (45 enterprises), to remain

relevant (20 enterprises) and to meet customer needs (15 enterprises). Most of participants of the survey define innovation as a creation of something new or a creation of something different as shown in Figure 3.

Most respondents (92.86%) declared that they implemented in their businesses any new activity during the last year, which enabled them to operate their business in a more efficient and effective way, specifically addressed perceived deficiencies in their business operations. Innovations declared by the respondents from the surveyed businesses were referred as implementing, among other things, new products (98.57%), methods (41.43%), practices (18.57%) and new ways of doing things (58.57%) – Figure 4. Innovation was made to improve the businesses either by increasing their abilities to generate income or their efficiencies.

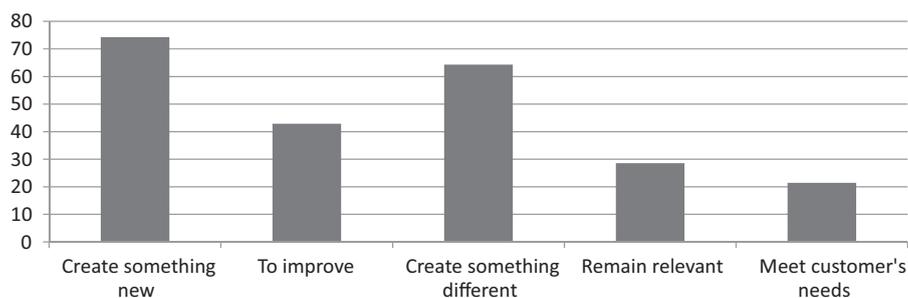


Fig. 3. Defined innovations by respondents
Source: Calculations on the own research.

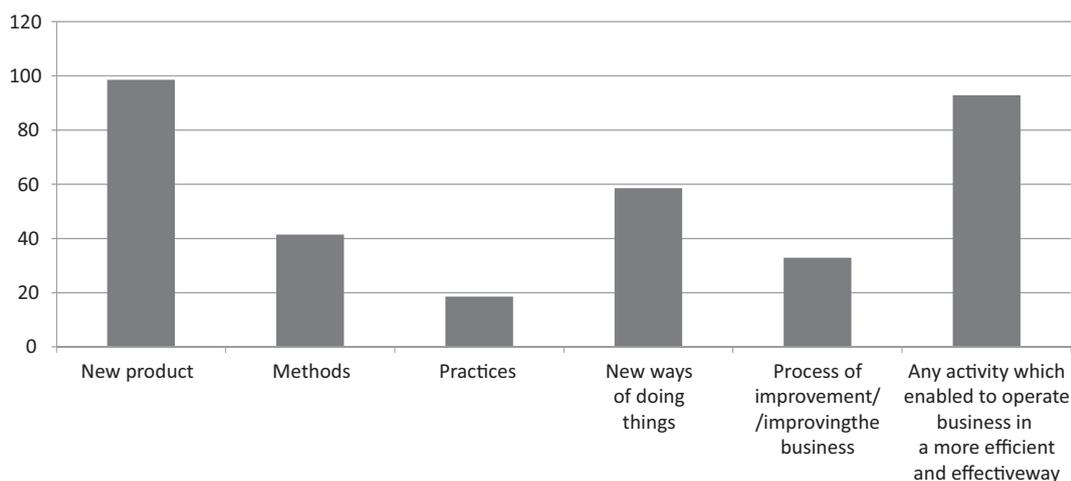


Fig. 4. What kind of innovations respondents used in their enterprises during the last year
Source: Calculations on the own research.

With this perspective in hand, 32.86% participants indicated that innovation was a process of improvement whereas 92.86% of them regarded innovation as any new activity which enabled them to operate their business in a more efficient and effective way (92.86%), specifically addressed perceived deficiencies in their business operations.

Observations show that most innovations that take place within foodservice businesses are related to the menu, which is a key component which entices potential customers to dine in an establishment. It has been noted that foodservice businesses operating in high competition are more likely to introduce changes than those which do not have any competition in the near area. All surveyed businesses declared that they made some changes to the menu in the last year. Respondents declared that the menu changed several times a year, introducing new seasonal products. The surveyed businesses pointed out that they create new dishes, to improve something in the menu, or sometimes create something different to meet current customer needs.

DISCUSSION

Product/service innovations are identified as new or significantly improved products and services [Hall 2009]. The necessity for foodservice businesses to retain competitiveness by being innovative has been well noted, mainly from a menu perspective [De Brentani 2001, Lin and Chen 2007, Alfiero et al. 2017]. These come in the forms of the development or introduction of new materials, intermediate products, or new components or product features [Camison and Monfort-Mir 2012]. These types of innovations are directly observable by customers and are considered as new [Hjalager 2010]. Examples of these innovations in foodservice are new menu items, new systems of service or a new foodservice concept. Innovation in service is often more closely connected to the way products are delivered. Entrepreneurs/managers can make menus more innovative so as to be able to respond properly to modern foodservice trends and create the offer that is in accordance with the customers' current demands. They can broaden the offer of dishes made with ingredients perceived by guests as healthy, such as whole grain cereals, organically grown food, low-energy and low-fat, gluten-free

food and other beneficial nutritional products as was noticed in surveyed businesses. One of the trends is also organic food but this offer is served in modern fine dining restaurants with the aim of making profit and offering new dining experiences. The conducted research indicates that in the restaurants this type of innovation has been introduced to the menu. The introduction of products considered by customers to be healthy was noticed both in small individual restaurants as well as in restaurant chains. Fast food restaurants should consider upgrading their offerings by introducing food based on whole grains. This trend can be observed on the McDonald's menu, where they have added whole-grain sandwiches. In their menu, a number of changes have been made to improve the nutritional value of the food. For example: reduced sugar content in buns to just 5%, reduced the sodium content of signature cheese by 20%. They introduced nutritional labelling to include percentage Daily Intake figures on packaging and that can to help customers make informed decisions about food choice. All nutritional labeling in the products is also available on the website [Gheribi 2017]. The healthy diet trend and consumers' knowledge about the connections between nutrition and health have led to an increase in consumption of reduced-fat content products, the so-called light products. Although there has been an increasing need for vegetarian dishes, the conducted research indicates that it is still difficult to find an adequate selection of such dishes on the menu in numerous restaurants.

For example, one of restaurant chains serving pizza and other Italian meals, added new offers of pizzas for people who prefer a healthy, light and vegetarian menu. They, through their website, inform customers about products used for food preparation and their caloric value, content of allergen and gluten.

Process innovations refer to process which take a place behind the scenes and aim to increase efficiency and productivity [Hjalager 2010]. For example, restaurant kitchens offer many approaches for process innovations such as food service technologies for faster and better preparation methods, energy and labor savings, waste reduction and better sanitation [Rodgers 2007]. This innovation was observed in restaurant chains. Process innovations also include professional staff engagement (sommeliers, barmen), home deliv-

ery and other activities that contribute to the improvement of a restaurant's performances. Researchers have shown that hiring a sommelier can increase beverage revenue by 15–25% [Robinson et al. 2005]. In several fine dining restaurants, it was noticed that a skilled sommelier or bartender was employed. Process innovations were least frequently identified in the surveyed restaurants. Surveyed businesses have declared that in the last year they introduced the possibility of ordering by telephone and/or delivery of ordered goods to the customer. Other businesses have indicated that they are considering introducing such an innovation. It has been noted that some medium-sized businesses are active in an area of corporate social responsibility. Activity in the area of corporate social responsibility can be considered as the innovation of a business. For example, it takes initiatives aimed at improving the comfort of working people by providing additional opportunities, offering growth opportunities, observing regulations and keeping promises, and involving employees in decision-making. In protecting the environment, they declare compliance with environmental regulations, proper use of resources, striving for the use of the most environmentally friendly technologies and reducing the amount of waste produced. For other examples, corporate social responsibility McDonald's takes part in: animal welfare, corporate giving/Ronald McDonald's House Charities, education scholarships, employment practices for, environmental practices, work with corporate social responsibility suppliers, corporate responsibility McDonald's reports [Gheribi 2017].

Organizational/managerial innovations relate to new or improved methods in a firm's management structure or system, organization of work or external relations [Hall 2009]. A main challenge for restaurant businesses is to develop ways to reduce staff turnover, maintain flexibility and control costs [Hjalager 2010]. Thus, these innovations focus on dealing with new ways of organizing internal collaborations, directing and empowering staff, building careers and compensating workers with pay and benefits [Ottenbacher and Gnoth 2005]. Training systems are in place to ensure the efficiency and effectiveness of the business. They provide an operational base that creates a working environment that supports quality, which in turn has the advantage of increasing customer satisfaction. For

these restaurants, systems were a prominent factor that explained why key staff members had been working in the establishments for a long period of time. Internal support mechanisms, such as training, allow a congruent flow on effect from employees who display a desire for creating a true dining experience for the customer. Innovations of this type have not been implemented frequently, and most of the surveyed businesses had problems with employee rotation. The medium size businesses provided its employees with training and a possibility of rise in their qualifications more than did small and micro businesses.

According to Kotler [Kotler et al. 2014], in order to achieve favorable business results, current business conditions require not only a quality gastronomic offer and professional service but also the constant and target promotion with the aim of making the potential guests conversant with the offer, while reminding the regular ones of the provided quality and informing them of new events related to restaurants' activity and offer. Marketing innovations are identified as the introduction of new marketing methods, which include changes in product design, promotional strategies and price [Camison and Monfort-Mir 2012]. Examples of marketing innovations include the use of social networking sites in promoting the business or customer loyalty programs. Many restaurants implementing information systems (e.g. digital menus, interactive dining tables) and creating websites and social media pages for the purpose of communication with customers. One of the methods of brand communication is sales promotion, which takes the form of special offers, discounts, coupons, gift cards or free sampling. Innovations had primarily been in the social media networking arena in the surveyed businesses. Social networking via the web was working well in each of the cases. Most surveyed businesses have websites and social media pages for purpose of communication. Social platforms such as Facebook allow specific information and messages to be announced immediately in relation to things restaurants are doing. Although, some interviewees declared that there was still no clearer message than traditional, social media were recognized to be working for many people.

Observations indicate that chains restaurants have websites and social media pages more often than the

individual restaurants. Also SMS texting and electronic mail services are the most popular ways for establishing direct communication with customers. The customers will decide to leave their personal data and give permission to be contacted in case they can somehow benefit from that. That is why the most efficient way of customers' data collection is through forming a loyalty club that would provide its members with certain discounts [Jang and Mattila 2005].

CONCLUSIONS

As highlighted in this paper, the changes that involve the foodservice sector e.g. the changes of consumers' taste and needs, call a different new approach to reply these requests through a more presence of innovation concept than in the past. Indeed, innovations help survive on the market to improve process and products and to upgrade business concepts. Entrepreneurs/managers should work on changing offers, creating new products that will replace the old ones once the clients stop ordering them. Innovations related to foodservice business are considered essential for the prosperity and business enhancement, evolving from a strategic option to a mandatory management task. Foodservice businesses differentiate themselves through menu choices (variation of ingredients and preparation methods), but rarely through novel technologies in food preparation. Even large fast-food chains and multinational contract foodservice businesses compete with small operators by the sheer size of their operations (economies of scale) and not with technological breakthroughs. Most innovations that take place within foodservice businesses are related to the menu, which is a key component which entices potential customers to dine in an establishment. Most of the surveyed businesses had websites and social media pages for purpose of communication. But most results generally indicate low creativity and innovative ideas among the managers. Gradual improvements occur as individual foodservice experiment to retain customer interest. Innovation options range from a single piece of equipment to a whole package supporting a food production system and are often based on culinary art, the science of cooking, food microbiology, engineering, packaging technology and computer modeling.

Lastly, the results provided some managerial indicators to improve the level of corporate efficiency, operating on technical decisions, in foodservice businesses. Indeed, this study showed that the innovation is an essential tool to remain in activity and offer a service following the changes of the market.

However, this study has a limitation: it is conducted in a small number of businesses located only in two cities of Poland. Thus, to generalize the findings, future developments have been planned i.e. it will be repeated in a bigger sample covering more medium and big businesses as well as other cities in Poland and, then, the results will be compared with another model area of the European Union.

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INNOWACYJNOŚĆ W BIZNESIE USŁUGOWYM W WYBRANYCH PRZYKŁADACH Z ZAKŁADÓW GASTRONOMICZNYCH W DUŻYCH MIASTACH W POLSCE

STRESZCZENIE

Innowacje odgrywają ważną rolę dla przedsiębiorstw w zachowaniu ich konkurencyjności i zapewnieniu długotrwałego przetrwania na dynamicznych rynkach. Artykuł ma na celu przedstawienie innowacji w zakresie oferty (produktu/usługi) lub procesu organizacyjnego/marketingowego w branży gastronomicznej i jest przedstawiany jako czynnik budujący konkurencyjność branży gastronomicznej. Badanie przeprowadzono z wykorzystaniem jakościowej, konstruktywistycznej perspektywy oraz ilościowej metody badawczej, która odbyła się w okresie od stycznia do listopada 2017 r. Obserwacje i wywiady przeprowadzono z przedsiębiorcami z branży gastronomicznej należących do krajowych i zagranicznych sieci działających na rynku polskim, a także indywidualne firmy gastronomiczne z Warszawy i Łodzi. Badaniem objęto 70 firm, 5 należących do sieci i 65 restauracji indywidualnych, 40 w Warszawie i 25 w Łodzi.

Słowa kluczowe: innowacyjność, strategia, zarządzanie, konkurencyjność

ECONOMIC PERFORMANCE OF SECTORS ALONG THE FOOD SUPPLY CHAIN – COMPARATIVE STUDY OF THE EUROPEAN UNION COUNTRIES

Jarosław Gołębiowski  

Warsaw University of Life Sciences – SGGW

ABSTRACT

The study presents analysis of supply chains for agricultural products in EU countries. Supply chains are sets of interrelated production and trade economic activities, carried out in a specific sequence. In the agri-food sector, the chains encompass activities carried out at the farm level and then continued during primary and secondary processing and distribution to final recipients. The aim of the article is to analyze diversity of economic results and changes in labour productivity dynamics in individual sectors of the supply chain in the EU member states in years from 2008 till 2016. The findings have shown that economic results of individual sectors in the supply chain of food products differ substantially both along the supply chain and between individual EU countries.

Key words: supply chains, food sector, economic results

INTRODUCTION

Development of agriculture and the food sector in the modern world results from both imminent economic processes and the domestic agricultural policy being implemented, taking into account the local conditions, as well as the global trends that determine the place of the agricultural sector in economy of individual countries, its significance and directions of changes [Kowalski et al. 2011]. The food sector in the EU as a whole is facing serious challenges due to changes in economic and non-economic conditions. These include lifestyle changes, global food consumption growth, decreasing area of land for production, increased demand for alternative non-food uses of agricultural raw materials [Moreira 2011, Handayati et al. 2015, EC 2017], as well as – equally important – a change in the approach of the society to the consequences of functioning of the food

system in relation to environmental issues, expressed by the “sustainable development” concept [Schmitt et al. 2014]. Assessment of sustainability of the food sector must take into account many economic, environmental and social aspects [Wijnands and Ondersteijn 2006]. In order to face these challenges, the food chain must undergo innovations with regard to improvement of processes and their adaptation to the changing demands of customers [Juchniewicz 2009, Urban 2009, Lewandowska 2014, Moragues-Faus et al. 2017].

One of the significant areas of assessment of competitiveness and sustainability of the food sector is measurement of economic results [Latruffe 2010]. It encompasses comparisons of economic sectors over time, in relation to other branches, as well as international comparisons. Such analyses are significant not only from the scientific point of view – they are also of key importance for development of the economic

policy. Assessment of alternative policies includes comparison of the present economic results and the possible effects of implementation of alternative solutions [Christensen and Jorgenson 1973].

Research on competitiveness and economic development is usually focused on a country as the analyzed unit, as well as the national conditions and policies as the driving forces behind this development. Nevertheless, for a long time, focus has been placed on differences in economic results in individual regions, countries and between countries [Porter 2003]. This suggests that many significant factors determining economic results can be found at the regional level, as well as in international comparisons. Extensive literature is available on regional economic development [Scott 2000, Hanson 2001, Kołodziejczak 2008, Baer-Nawrocka and Markiewicz 2012]. On the other hand, researchers are less eager to deal with issues of measure of economic results of sectors in supply chains on the global scene.

The purpose of this study is to examine the facts and relations occurring in the supply chain. Using the EU economy as the example, assessment of differences between individual countries was made with regard to significance of the food sector in national economy. The measure of added value and number of employees was applied in this regard. Moreover, the study includes an assessment of differences in dynamics of development of the food chain in individual countries on the basis of labor productivity. Differences in labor productivity between the supply chain sectors in individual countries have also been examined.

RESEARCH METOD AND DATA SOURCE

The study is an attempt to assess results achieved by production and trade sectors in the food supply chain. The set of data for the EU countries and the basic sectors of the food supply chain (agriculture, food sector, wholesale trade in agricultural and food products and retail trade) was used to determine the basic facts of functioning of supply chains in the international context, taking into account the labor productivity dynamics of individual sectors. Labor productivity is often mentioned as a measure of competitiveness [Latruffe 2010, Szczepaniak 2014], and the European Commission regards it to be the most reliable measure of

competitiveness over the long-term perspective [EC 2008, 2014]. The relation of added value in prices of production resources to the number of employees was used as the measure of labor productivity in the food industry and the retail and wholesale trade in food. In the EU statistics, this measure is expressed in thousands of EUR per employed person [EC 2018].

Moreover, the study includes assessment of significance of food supply chains in economy of individual EU member states. The later was based on analysis of the share in added value and employment, as well as assessment of importance of food in consumption expenditures of households. The basic sources of data used in the study were Eurostat data and literature on the subject.

THE STRUCTURE AND SIGNIFICANCE OF THE FOOD SUPPLY CHAIN IN THE EUROPEAN UNION

The food supply chain encompasses various products and companies that operate on different markets [Szymanowski 2008, Gołębiewski 2010]. The food supply chain combines three major sectors: agriculture, food and distribution (wholesale and retail) – Figure 1. The basic agricultural products go through many processing and distribution phases to be sold to consumers as final food products. The presented model of the food supply chain indicates the main links and interactions between them in the food production and distribution process. Due to great diversity of food supply channels, existing in practice, the model applied has been simplified. The first sector taken into account in the food supply chain is the agricultural sector. As agricultural commodities include very different products, the distribution channels of this sector are equally diversified. The agricultural sector companies sell their products to the food and fodder sectors. Obviously, they can also deliver the final food products directly to retail sellers and end consumers and supply markets for alternative uses of biomass (such as the biofuel and biomaterial production sector), which are significant components of the developing bio-economy.

The food sector encompasses many diverse types of processing activity. These include refining plants (sugar production), milling (cereals), washing, cutting, drying or freezing (fruit and vegetables), as well as slaughter

and cutting of meat (livestock). These processes end in emergence of various products, which are packaged and sent to clients (distributors, catering). Other important aspects of activity of food producers include market and marketing research, as well as research and development works [Firlej 2008]. The distribution sector (particularly retail trade) is also the main sales market for food products, which exerts direct impact on end consumers through marketing activity as the last link in the supply chain. Supplies of products from processing to retail trade may take place directly or through the agency of specialist wholesalers.

Relations between individual links and entities in the supply chain include the contractual, as well as the

technical aspects. Contractual links, in general, refer to interactions between the buyer and the seller and they depend on the relative market power of individual companies [Goodhue 2011]. From the technical perspective, transfer of products encompasses many activities that generate additional economic costs (transport, storage and logistics) [Rutkowski 2004, Klepacki and Wicki 2014, Klepacki 2016]. Moreover, functioning of the food supply chains is influenced by many external factors, such as legislation, state policy or macroeconomic conditions. One should also bear in mind such factors as accessibility of natural resources, environmental conditions, social and technical factors. Sectors that belong to the food supply chain also interact with

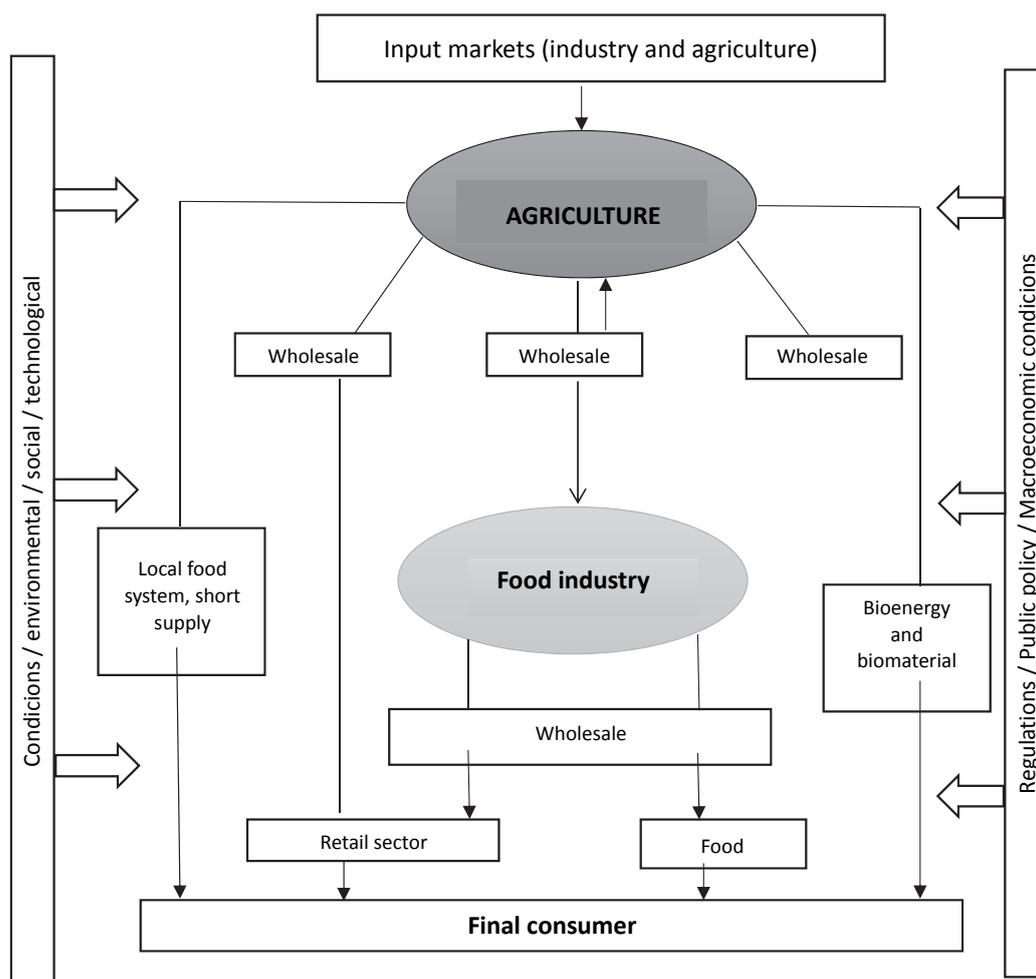


Fig. 1. Structure food supply chain in terms of bioeconomy
Source: Own elaboration.

Table 1. Sector shares in total valued added and total employment in 2016 (%)

Specification	Value added, gross					Persons employed – number				
	agriculture, forestry and fishing	manufacture of food products; beverages and tobacco products	wholesale of agricultural and food products	retail sale of food, beverages and tobacco	total agricultural and food	agriculture, forestry and fishing	manufacture of food products and beverages	wholesale of agricultural raw materials, food, beverages and tobacco	retail sale of food, beverages and tobacco in specialised stores	total agricultural and food
European Union	1.5	2.1	0.9	1.4	5.9	4.5	2.0	1.0	3.1	10.6
Belgium	0.7	2.2	0.9	1.4	5.1	1.3	2.1	0.9	2.7	7.0
Bulgaria	4.7	2.8	1.6	1.5	10.6	18.0	2.7	1.5	3.3	25.6
Czechia	2.3	2.3	0.7	1.4	6.7	3.1	2.2	0.7	3.1	9.1
Denmark	1.1	1.7	1.0	0.1	4.0	2.4	1.9	0.9	0.4	5.7
Germany	0.7	1.7	0.8	1.1	4.4	1.4	2.0	0.8	2.9	7.2
Estonia	2.4	2.1	1.1	1.5	7.1	3.9	2.4	1.1	3.3	10.7
Ireland	1.0	3.5	1.0	1.3	6.9	5.5	2.3	1.3	4.3	13.4
Greece	4.1	3.6	1.0	1.1	9.8	11.3	2.8	1.6	3.9	19.6
Spain	3.0	2.8	1.4	1.7	8.8	4.0	2.0	2.0	3.6	11.7
France	1.6	2.3	0.8	1.4	6.1	2.7	2.3	0.8	2.7	8.5
Croatia	3.8	3.9	0.6	2.3	10.6	7.5	3.8	0.7	4.0	16.0
Italy	2.1	1.8	0.7	1.3	6.0	3.7	1.8	0.9	2.7	9.1
Cyprus	2.2	1.8	1.3	2.1	7.4	4.0	3.2	1.7	3.5	12.4
Latvia	3.7	2.5	1.0	1.8	9.0	7.6	2.7	1.2	4.2	15.8
Lithuania	3.4	4.1	1.4	1.4	10.3	8.0	3.1	1.3	4.0	16.4
Luxembourg	0.2	0.6	1.7	1.0	3.5	0.9	1.4	n.d.	2.3	n.d.
Hungary	4.6	2.2	1.0	1.7	9.5	6.0	2.4	1.0	3.2	12.6
Malta	1.4	1.6	1.2	1.6	5.7	1.5	1.9	n.d.	3.0	n.d.
Netherlands	2.0	2.4	1.8	1.2	7.4	2.2	1.5	1.3	4.0	9.0
Austria	1.2	1.8	1.1	1.4	5.6	4.0	1.9	1.1	3.0	10.0
Poland	2.7	3.5	0.9	1.3	8.3	10.6	2.6	0.9	2.9	16.9
Portugal	2.2	2.5	1.2	1.6	7.5	9.5	2.4	1.3	3.4	16.6
Romania	4.5	4.9	1.2	1.4	12.0	23.8	2.2	1.0	2.7	29.7
Slovenia	2.2	1.5	0.4	1.7	5.9	7.7	1.8	0.4	2.7	12.6
Slovakia	3.7	1.4	0.4	0.8	6.4	3.1	1.7	0.6	1.8	7.2
Finland	2.8	1.4	0.5	1.4	6.1	4.2	1.5	0.5	2.5	8.7
Sweden	1.3	1.2	0.8	1.1	4.4	2.1	1.3	0.9	2.4	6.6
United Kingdom	0.7	1.5	0.7	1.7	4.7	1.3	1.6	0.8	3.6	7.2

Source: own calculations based on EC [2018].

other sectors of economy, both as purchasers and as suppliers of raw materials and means of production.

Sectors that make up the food supply chain – agriculture, food industry and food distribution and retail trade – in total represent around 6% of added value of the EU and 10.6% of employment in the EU (Table 1). The share of the food sector, beverage production and wholesale and retail trade in food products is usually higher in the new than in the EU-15 countries. The highest shares of the food sector in national economy in year 2016 was recorded in Romania, Croatia, Bulgaria and Lithuania (above 10%), and the lowest – in Luxembourg, Denmark, Sweden, Germany, Great Britain – below 5%. The share of added value of agriculture was the lowest in Luxembourg (0.2%). It was the highest in such countries as: Bulgaria, Hungary, Romania and Greece – from 4.1% to 4.7%. The share of added value in the food industry was particularly high in Romania, Lithuania and Croatia. Among the EU member states, the wholesale trade sector recorded the highest share in total added value in such countries as: the Netherlands, Luxembourg, Bulgaria.

The highest share of food sector in total employment was the highest in Romania and Bulgaria (above 25%). It was the lowest in Denmark and Sweden. Farming activity in Europe hires about 4.5% of all employees in national economy, and the food sector – around 2%. About 3% of all employees in the EU

worked in the food product distribution sectors. The share of employment in the food industry and wholesale was higher in the new member states.

The economic importance of the food supply chain can also be measured by analyzing the share of food expenses in total household expenditures. On the food market, consumers act as sovereign entities, independently shaping the demand level and structure (expenditures and consumption) for food products and services. The demand results from the needs, financial capabilities, consumption patterns and lifestyle. Consumption patterns have developed over many years, and they are determined by economic factors, technological progress, political situation, environmental issues, as well as social and cultural conditions [UNEP 2016].

Significant conditions that determine demand for food are mainly economic factors including prices and income levels, which are decisive for economic accessibility of food [Gulbicka and Kwasek 2006]. The basic principle, observed as the consumer income increases, is the tendency to reduce the share of food expenditures in total expenditures. On the average, in 2016, the EU households spent about 12.2% of their expenditure funds on food and beverages (Fig. 2).

This share is usually reduced along with growth of GDP per capita and vice versa. Therefore, the share of food expenditures was usually higher in the new member states, and lower in the EU-15 countries.

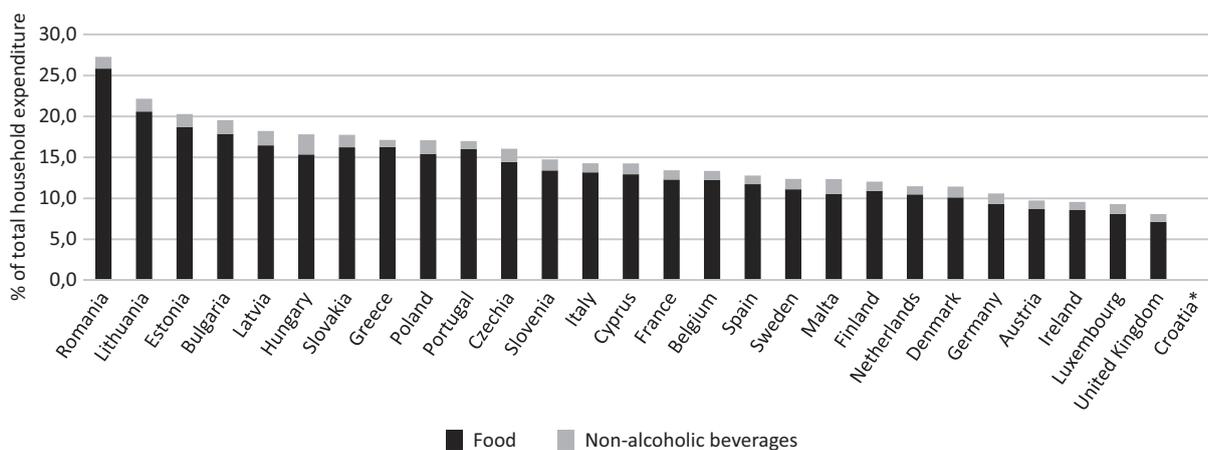


Fig. 2. The share of food and beverage purchases in total household expenditures in the EU in 2016
Source: Own calculation based on EC [2018].

DIFFERENCES IN LABOR PRODUCTIVITY IN THE SUPPLY CHAIN BETWEEN THE EUROPEAN UNION MEMBER STATES

Diversity of labor productivity is one of the basic measures of economic results achieved in economic sectors. On the basis of Eurostat data, changes in labor productivity in the EU were analyzed in six sectors, identified in the food product supply chain, including two production sectors (agriculture, forestry and fishing; manufacture of food products) and four distribution sectors (wholesale of agricultural raw materials and live animals; wholesale of food, beverages and tobacco; retail sale in non-specialized stores with food, beverages or tobacco predominating; retail sale of food, beverages and tobacco in specialized stores).

Labor productivity measured as the relation of added value to number of employed was diversified in 2016 in individual sectors of the supply chain in the EU (Table 2).

The highest indicators were recorded in wholesale trade in food products. Both in trade in agricultural raw materials and in wholesale trade in food products, labor productivity exceeded EUR 50 thousand per employed person. Labor productivity in the food process-

ing industry was only slightly lower (about EUR 46 thousand per employed person). On the other hand, labor productivity was much lower in retail trade sectors, where slightly higher indicators were recorded in non-specialized trade with food predominating. The lowest level of labor productivity was recorded in the agriculture sector – EUR 19.2 thousand per employed person. Average labor productivity in agriculture in years 2008–2016 increased by EUR 3.6 thousand per employed person, and its average annual rate reached 2.6%, representing the highest indicator in the food supply chain. Detailed data on differentiation of the rate of growth of labor productivity in individual EU has been presented in Figure 1 in the Annex. Among the EU-15, the highest rate of growth of labor productivity was recorded in Ireland and Denmark, and among the new EU – in Malta, Croatia and Poland.

The average annual rate of growth of labor productivity in the labor industry amounted to 2.3%, in the sector of wholesale trade in agricultural products – slightly above 2%, in trade in food products it amounted to 2.43%, and in non-specialized retail trade – 2.4%. In all of the analyzed sectors, there were substantial differences in the pace of growth of labor productivity between individual countries (Figs. 3–8).

Table 2. Differences in labor productivity in the food product supply chain sectors in the EU

Specification	Apparent labour productivity (gross value added per person employed)					Growth rate apparent labour productivity in 2008–2016 (%)		
	UE-28 total	min	max	SE	CV	UE 28 total	min	max
	EUR thousand							
Agriculture, forestry and fishing	19.2	3.1	64.2	16.3	84.6	2.59	-0.91	7.00
Manufacture of food products	46.0	7.6	162.0	33.0	71.8	2.33	-3.69	7.19
Wholesale of agricultural raw materials and live animals	52.0	18.9	94.1	20.3	39.1	2.04	-10.67	14.45
Wholesale of food, beverages and tobacco	53.0	18.7	198.2	41.0	77.4	2.43	-2.89	7.25
Retail sale in non-specialised stores with food, beverages or tobacco predominating	27.0	9.3	52.9	12.2	45.3	2.38	-2.59	8.27
Retail sale of food, beverages and tobacco in specialised stores	20.0	2.0	44.6	12.3	61.6	0.00	-7.48	6.80

Source: Own calculation based on (EC, 2018)

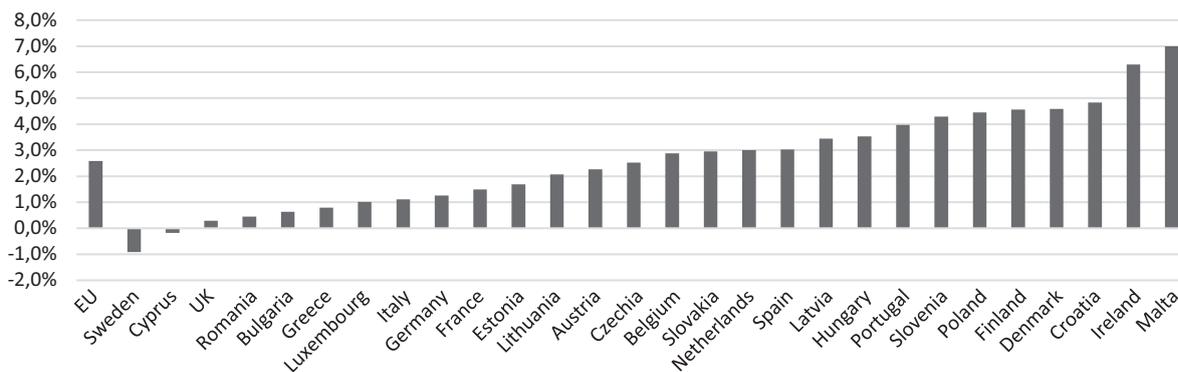


Fig. 3. Average annual growth rate for labor productivity in sector agriculture, forestry and fishing in years 2008–2016
Source: Own calculation based on EC [2018].

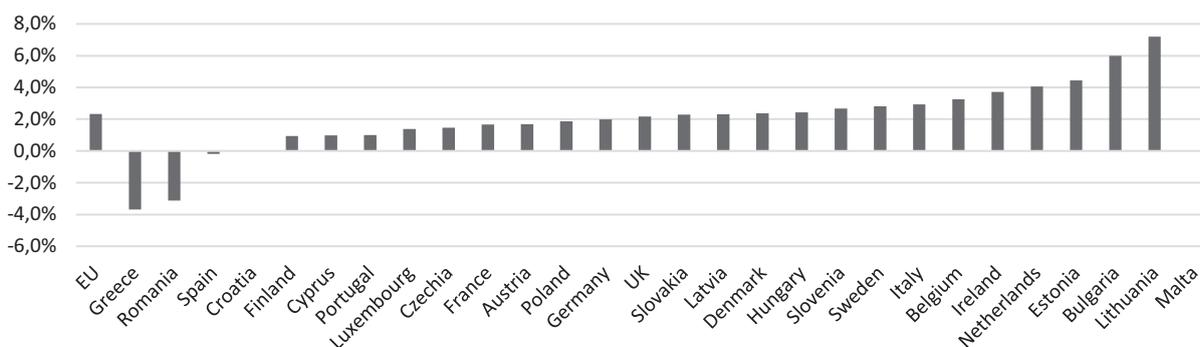


Fig. 4. Average annual growth rate for labor productivity in sector manufacture of food products in years 2008–2016
Source: Own calculation based on EC [2018].

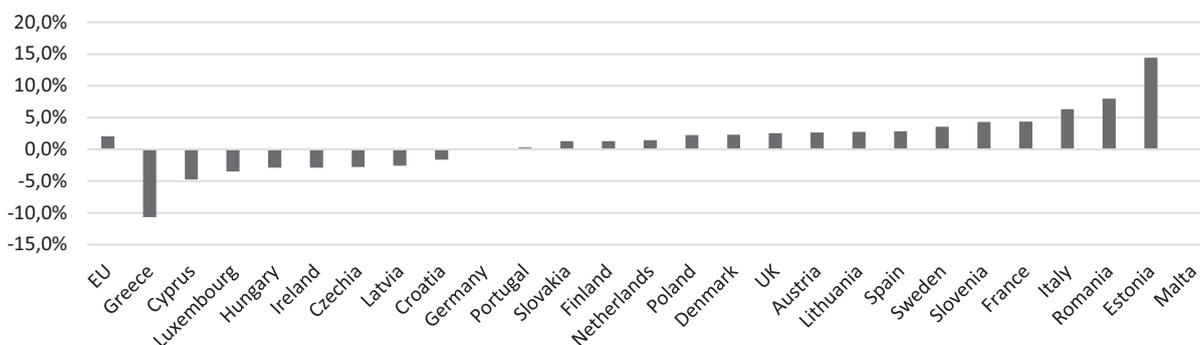


Fig. 5. Average annual growth rate for labor productivity in sector wholesale of agricultural raw materials and live animals in years 2008–2016
Source: Own calculation based on EC [2018].

In the food industry, the highest labor productivity growth was recorded in Lithuania and Bulgaria. On the other hand, decrease in productivity was recorded in Greece, Romania and Spain. In retail and wholesale

trade, the group of countries that recorded the lowest labor productivity growth in this period included Estonia and Romania (wholesale trade in agricultural raw materials), Luxembourg and Estonia (wholesale trade

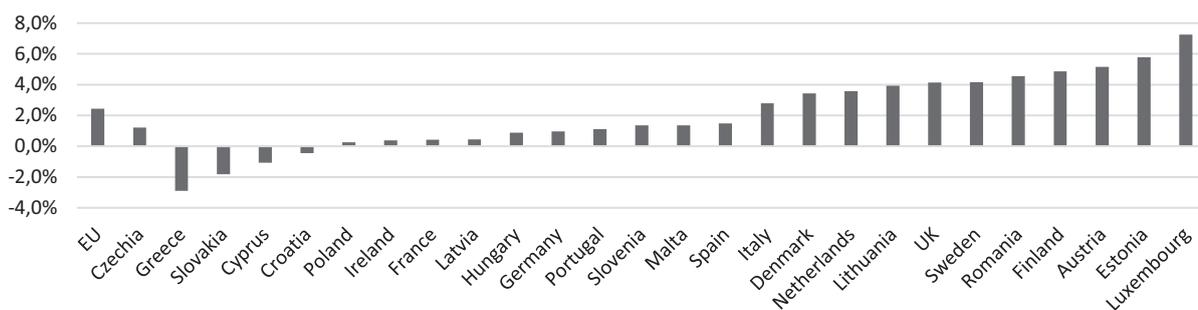


Fig. 6. Average annual growth rate for labor productivity in sector wholesale of food, beverages and tobacco in years 2008–2016

Source: Own calculation based on EC [2018].

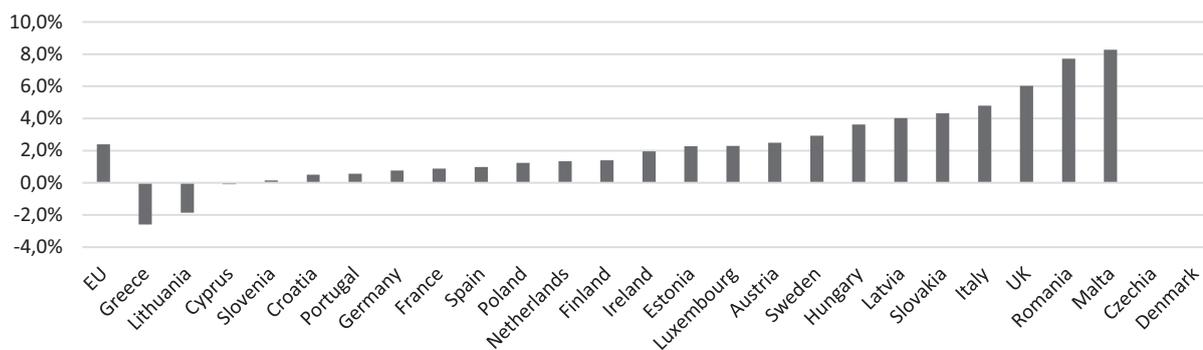


Fig. 7. Average annual growth rate for labor productivity in sector retail sale in non-specialised stores with food, beverages or tobacco predominating in years 2008–2016

Source: Own calculation based on EC [2018].

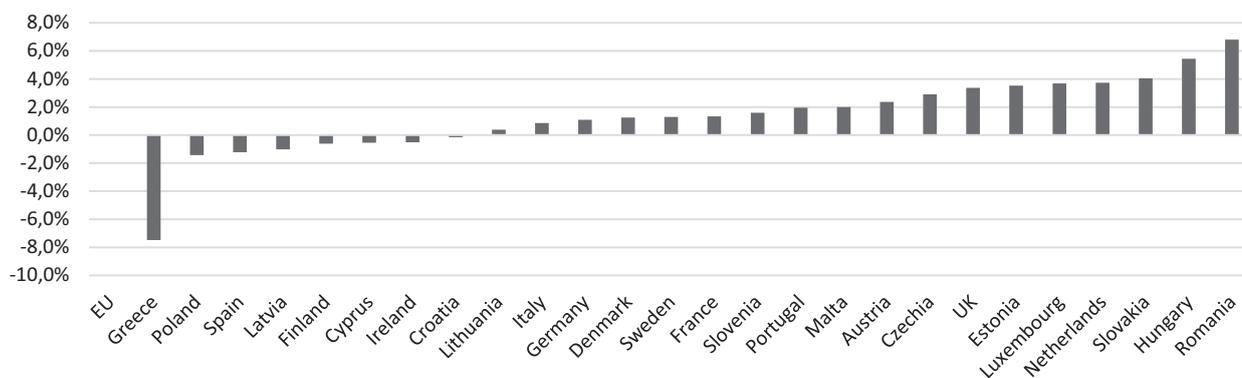


Fig. 8. Average annual growth rate for labor productivity in sector retail sale of food, beverages and tobacco in specialised stores in years 2008–2016

Source: Own calculation based on EC [2018].

in food products), Malta and Romania (non-specialized retail trade) and Romania and Hungary (specialized retail trade). The potential causes of these differences included: intensity of use of IT and communication technologies, differences in intensity of competition, differences in legislative frames and the labor market policy. Increase in labor productivity in the analyzed sectors of the food supply chain was in general higher in the new member states. This reflects to a great extent the effects of catching up and the lower preliminary productivity levels. The existing differences may suggest the potential for further labor productivity improvement in the EU food supply chain.

CONCLUSIONS

The analyses conducted indicate that the highest share of the food sector in national economy is recorded in the “new” EU member states. The presented comparison of significance of the food supply chain for economy of individual EU leads to conclusion that labor productivity is greatly diversified among the EU countries. Countries, which acceded to the EU after year 2004, differ greatly from the states of Western Europe in terms of labor productivity. The EU-15 countries achieved a much higher level of labor productivity. This fact was associated, among other things, with a higher share of employment in the food sector in the new EU (even above 25% in Romania and Bulgaria).

Such diversity could also be observed in individual sectors of the supply chain. Dominant in terms of the productivity level was the sector of wholesale trade in food products, as well as food processing. Productivity in these sectors reached almost EUR 50 thousand per employed person. Retail trade recorded a lower level of productivity. Nevertheless, labor productivity was the lowest in the agriculture sector. The differences were often quite substantial. The difference between agriculture and wholesale trade was more than 2.5 times in favor of wholesale trade.

On the basis of the analyses conducted, it can be stated that, on the average, in the European Union, a tendency of growth in labor productivity was recorded in all sectors of the food supply chain. Nevertheless, some countries recorded a decrease in this regard.

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WYNIKI EKONOMICZNE SEKTORÓW W ŁAŃCUCHU DOSTAW ŻYWNOCI – BADANIA PORÓWNAWCZE KRAJÓW UNII EUROPEJSKIEJ

STRESZCZENIE

Opracowanie przedstawia analizę łańcuchów dostaw produktów rolnych w krajach UE. Łańcuchy dostaw stanowią zbiory powiązanych ze sobą, realizowanych w określonej sekwencji działań gospodarczych produkcyjnych i handlowych. W sektorze rolno-żywnościowym łańcuchy obejmują działania, które realizowane są na poziomie gospodarstwa rolnego, a następnie są kontynuowane w trakcie przetwórstwa pierwotnego, wtórnego oraz dystrybucji do finalnych odbiorców. Dokonano analizy zróżnicowania wyników ekonomicznych oraz zmian w dynamice produktywności pracy w poszczególnych sektorach łańcucha dostaw w krajach UE w latach 2008–2016. Badania wykazały, że wyniki ekonomiczne poszczególnych sektorów łańcucha dostaw artykułów żywnościowych różnią się znacznie zarówno wzdłuż łańcucha dostaw, jak i między poszczególnymi krajami UE.

Słowa kluczowe: łańcuchy dostaw, sektor żywnościowy, wyniki ekonomiczne

THE PROBLEM OF THE OPTIMAL VOLUME OF ENTERPRISE PRODUCTION IN THE LIGHT OF THE THEORY OF TRANSACTION COSTS AND THE PRACTICE OF OUTSOURCING

Sławomir Jarka  

Warsaw University of Life Sciences – SGGW

ABSTRACT

The purpose of the article was to determine the importance of outsourcing and transaction costs accompanying it in the process of optimizing company structures. The practical reference of the adopted research objective was to indicate the optimal size of the enterprise. The aim is also to indicate, based on literature research, the impact of the transaction cost theory on the development of outsourcing.

The findings of research show that the optimal size of the enterprise corresponds to the production volume at which the transaction function indicates the decreasing level of their marginal product, until the value reaches 0. With a high specificity of the company's resources, which requires the use of specific technologies, there are transaction costs on this account that shape the price of the goods being the subject of the transaction. Thus, when further increasing the size of the production company, one should also take into account the added transaction costs, among others, control and monitoring of transactions. Modern enterprises focus their actions on key areas of activity. They give up production of what outsourcing providers can do more effectively, leaving what is specific for a given product, determining the company's identity and the essence of production.

Key words: transaction costs, outsourcing, enterprise production volume

INTRODUCTION

Enterprises in the modern economy are constantly looking for solutions leading to more and more effective strategies that would ensure achieving and maintaining a market advantage. One of such solutions is the use of outsourcing since the 1980s. The analysis of outsourcing issues indicates that this concept is still developing dynamically. This is evidenced by numerous publications of scientific articles. The analysis of data based on the EBSCO database shows that in the 1980s the problem of outsourcing was discussed in a dozen articles on average in a year. In the nineties, such articles appeared from several hundred to 1,800.

Currently, researchers even in around 7,000 scientific articles undertake the problem of outsourcing. The number was determined based on the EBSCO database analysis, access January 2018.

The use of outsourcing, according to practitioners and theoreticians is currently the basic means of improving the efficiency of enterprises on a global scale. In contrast to the process of internalisation, developed in large, global enterprises, outsourcing enables the coordination of internal and external processes, whose suppliers are specialized units, leaders on the local, national or even global market.

In the past, enterprises more often chose development through the implementation of basic and aux-

Sławomir Jarka  <https://orcid.org/0000-0003-0369-9905>

 slawomir_jarka@sggw.pl

iliary functions within the enterprise (development through autarchy that is economic self-sufficiency). This increased the possibility of achieving returns to scale by the individual, but at the same time reduced its mobility and resistance to crises. In centralized organizations, economic self-sufficiency additionally led to shifting decision-making powers from lower to higher levels of management (the problem of excessive centralization of structures). Nowadays, managers realize that the rationality of business management can be achieved through proper allocation of resources as part of vertical integration [Urbanek 2012]. Where costs of coordination by prices are greater than the cost of coordination by the company, maintaining or creating company structures is economically justified. However, as Coase points out [1993], where the costs of market coordination are lower or equal to the costs of management, there is no justification for maintaining the structures of the enterprise. Therefore, the implementation of the outsourcing process remains, which becomes justified due to economic reasons.

An important aspect of the conducted research was the presentation of the possibilities of using outsourcing in small enterprises in the context of the level of transaction costs. From this point of view, this is an innovative approach, since the research attempt actually addresses the question of what the optimal size of enterprises is, due to the level of transaction costs and the use of outsourcing.

A certain limitation of the presented research is the lack of empirical verification. However, on the other hand, this is another stage, which the author undertakes to verify the considerations presented in the article based on the research sample of small enterprises. The results of these tests will be presented in a separate article.

MATERIAL AND METHODS

The purpose of the article was to determine the importance of outsourcing and transaction costs accompanying it in the process of optimizing company structures. The practical reference of the adopted research objective was to indicate the optimal size of the enterprise.

The aim is also to indicate, based on literature research, the impact of the transaction cost theory on the development of outsourcing.

The problem of using the services of external suppliers or developing structures that may provide such services inside the enterprise is present in economics and management, practically from the beginning of their historical development. In practice, this problem referred to the entrepreneur's dilemma whether to produce or buy ("make or buy"). For a long time, there have been categories such as cooperation and co-operators in management, vertical integration and horizontal integration, experience curve and returns to scale of production. Increased interest in outsourcing in the sector of small and medium enterprises results from the need to find such a management system that would significantly expand the possibilities of dealing with the growing complexity of the environment, especially turbulent changes in the area of technology and management quality. Enterprises have practically always used the services of external suppliers, mainly in the area of auxiliary functions (non-core business), but also basic functions (core business) [Sobiecki and Pietrewicz 2011].

RESULTS AND DISCUSSION

The theory of transaction costs as justification for outsourcing

An example of the practical application of the Coase theorem is the outsourcing practice applied since the 1970s [Trocki 2001, Radło 2013]. In essence, it consists in transferring tasks and processes to be implemented by external units specialized in a given field. It means separating the functions they carry out from the organizational structure of the enterprise and transferring them to other external entities.

Modern enterprises can operate and develop according to one of two alternative management concepts that is, based on hierarchical (vertical) or market (horizontal) coordination [Urbanek 2012]. Hierarchical coordination means the implementation of various activities (production) in the enterprise, ultimately leading to the self-sufficiency of such units. This model of development was used in conditions of difficulties in

supplying enterprises and led to very limited contacts with the market environment. In turn, the concept of market coordination assumes that enterprises operating on the principle of an open system fulfil their supply needs through the market. This translates to the process of resource management, which in this case can be sourced from the environment.

Production costs are not the only determinants of the dichotomous division of the resource allocation mechanism, i.e. hierarchical and market coordination. They are actually a reference to the expenditures incurred and the result of the involvement of production factors in the enterprise. However, the total costs associated with the application of different resource allocation rules also include transaction costs [Allen 1999, Hardt 2009].

Transaction costs generated within the company include:

- costs of making decisions;
- costs of supervision over the implementation of decisions;
- information processing costs;
- costs of employee productivity measurement.

It is also possible to add the costs of moving within the enterprise, for example, logistics costs. Their size depends on the scale of production. After exceeding a certain level of company's resources, there may be a decrease in the effectiveness of the company's operations.

Transaction costs in the market dimension (accompanied by horizontal coordination) include [Daniłowska 2007]:

- costs related to obtaining and processing information about prices;
- costs of creating contracts and costs of their negotiations.

Many factors determine the level of transaction costs associated with choosing a coordination mechanism. Transactions carried out within a vertically integrated organization are not subject to a market mechanism, which in turn is the essence of market coordination. Therefore, enterprises are forced to increase the number of management levels, which results in greater problems in the decision-making process. The natural mechanism of opportunistic behaviour develops,

which consists in presenting the goals of the organizational unit over the goals of the entire organization [Hard 2009].

In turn, transactions conducted as part of the organization's market coordination (horizontal) may generate a high level of transaction costs, which in this case may reduce the effectiveness of the entire mechanism. According to Williamson [1998a], this phenomenon is conditioned by:

- the specificity of assets;
- uncertainty;
- transaction frequency.

When the subject of the transaction are specific resources requiring the use of specific technologies, capital-intensive or inaccessible due to their innovative nature, there is a need to apply appropriate guarantees and security. There are transaction costs connected with such activities, which ultimately shape the price of the goods being the subject of the transaction [Williamson 1998a].

Figure 1 shows the relationship between the specificity of an enterprise's assets and the types of transactions. The symbol "k" denotes specific assets required in the transaction, whereas in transactions related to common and generally available technology, $k = 0$. However, if the technology is specific, $k > 0$. The parties to the contract enter into strong interdependencies and it is in their interest to introduce appropriate guarantees and security (s). $S = 0$, when no security is applied, and when it is used, $s > 0$.

In the case of the ideal transaction (case A), when there is no dependence related to the specificity of assets, i.e. $k = 0$, the only security is the competition mechanism on the market ($s = 0$). Case B presents the exchange risk, which requires investment in specific assets ($k > 0$), but no forms of security have been applied ($s = 0$) [Williamson 1998b]. By stating the existence of risk, the parties will include them in the price. C and D are cases in which additional security has been applied, either in the form of a formal contract (C) or in the form of vertical integration (D), within a single ownership structure. According to Urbanek [2011a, b], hybrid solutions: capital compounds, joint ventures, long-term contracts, bilateral agreements, franchise are more flexible than

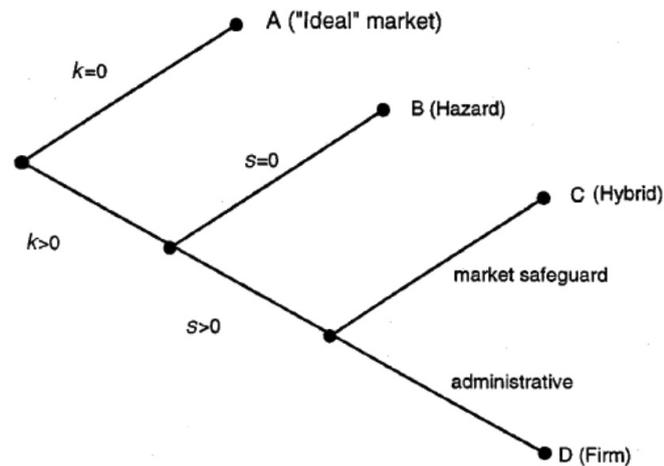


Fig. 1. Simple contracting schema

Source: Own compilation based on Williamson [1998b].

hierarchical coordination and at the same time more formalized than market coordination.

As Williamson points out [1998b], the problem of the specificity of enterprise resources affects the level of transaction costs. The author distinguishes six characteristics of resource specificity:

- location that reduces logistics costs;
- specialized physical assets (machines and devices);
- intangible assets that shape the level of market perception, e.g. a brand;
- the level of investments in buildings and their equipment in order to build long-term relationships with key market segments;
- the specificity of human resources (e.g. including unique competences, experience, etc.);
- schedule for the use of individual resources.

Specific resources cannot be easily replaced without additional transaction costs. These resources significantly affect the formation of competitive advantages of the company. The company's resources are a subsystem, so the previously mentioned elements are closely related [Pietrzak 2002]. This leads to an increase in the complexity of contracts between independent enterprises [Barthelemy and Quelin 2006]. The reasons for this complexity are seen by the authors in the problem of securing the interests of recipients, mainly due to the inevitable opportunism of suppliers.

Secondly, contracts should protect against over-reliance on suppliers. Contracts should also be flexible enough to allow the company to adapt to changing environmental conditions. The discussion shows that with a high level of resource specificity (which results in a high level of transaction costs), vertical integration can provide greater efficiency than market coordination.

Transaction costs can be considered on a micro and macro scale. On a micro scale, transaction costs are usually analyzed along with production costs. It can be said that enterprises aiming at improving the efficiency of resources used in the transformation process of expenditures, also strive to minimize the total production costs and transaction costs. However, there are fundamental difficulties with the measurement of the parts of transaction costs especially the costs of obtaining information, costs of time involved or costs of corruption [Staniek 2005]. In this sense, transaction costs relate to a more efficient institutional system, which is a constantly wanted value. It can be assumed that the level of transaction costs determines the limits of effectiveness of institutional solutions in the country. It is worth noting that a good level of legislation reduces these costs.

Figure 2 shows the transaction costs in a model approach, using the neoclassical approach. Therefore, it

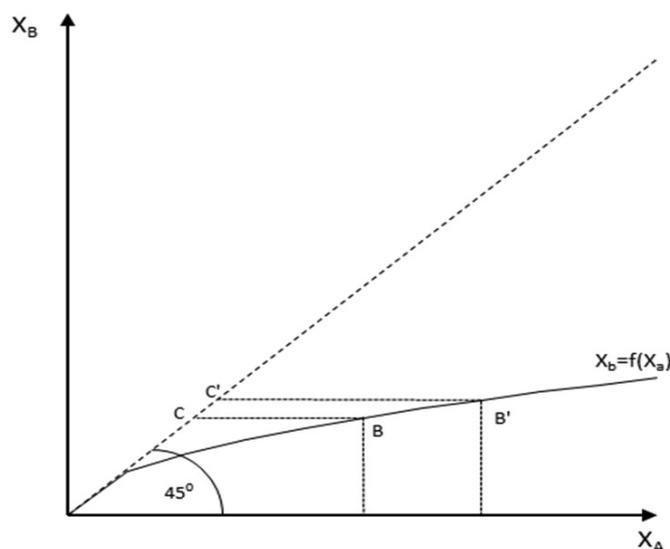


Fig. 2. Transaction function and transaction costs.

Source: Own compilation based on Staniek [2005].

was assumed that there is a lack of complete information on the market participants, i.e. the outsourcer and the client. This is an example of the occurrence of information asymmetry [Ménard 2005], which affects the opportunistic behavior of the parties. It also emphasizes the limited rationality of the behavior of suppliers and recipients. Figure 2 shows the amount of transaction costs, based on the difference between the planned production volume – X_a and the actual size and accepted by the buyer – X_b . The dashed line at a 45-degree angle illustrates the theoretical situation of the lack of occurrence of transaction costs between transaction participants. This is a hypothetical assumption, adopted for quantifying transaction costs, based on the planned and actually depicted production volume.

Section 0A presents the planned production volume, which corresponds to the AB section measuring the size of consumer demand. The flattening of the transaction function along with the increase in the number of transactions conducted indicates a decreasing level of their marginal product. At the same time, transaction costs are increasing, measured by the distance between the 45-degree line and the transaction function – the $B'C$ section is larger than the BC

section. This increase in transaction costs results from the limitation of opportunistic behaviour on the part of suppliers – outsourcers. The costs of controlling and monitoring transactions are increasing.

The problem of optimal production volume of the enterprise and the criterion of transaction costs

Contemporary enterprises strive to improve production and economic results through activities that optimize the size and structure of the resources involved. It affects the efficiency of their operation both from the supply and cost side. On the one hand, actions affecting the shaping of the level of revenues, both on the quantitative and qualitative side, are used, but actions aimed at optimizing production costs and fixed costs that are independent of the production volume are introduced.

The measure of the company's efficiency is to minimize the total sum of transaction costs and production costs. Considerations on this topic are presented in Figure 3. According to it, the higher the production and the level of specialization of production, the lower the production costs per unit. The growing specialization of production aids the reduction of production costs.

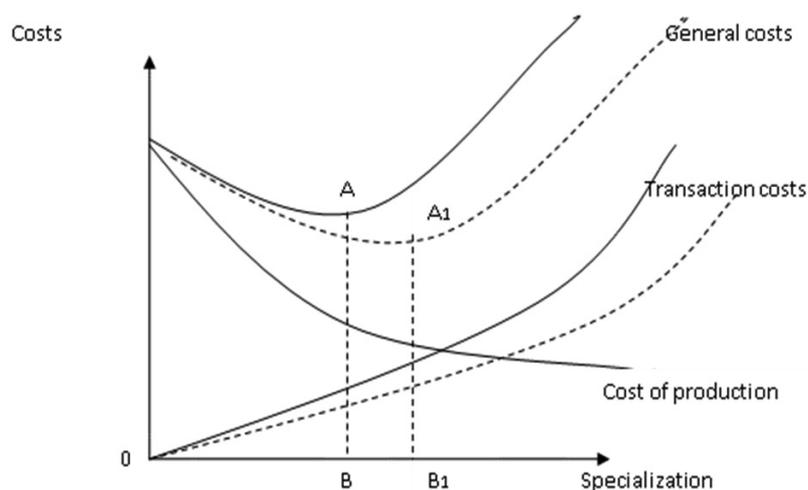


Fig. 3. Transaction costs and optimum business production
Source: Own compilation based on Staniek [2005].

Simultaneously, transaction costs increase, which is associated with the complexity and the greater frequency of interaction with entities, specialized in providing specific services. Figure 3 shows that the company's overall costs reach a minimum at point *A*. The optimal size of the enterprise is determined by point *B* (assuming the constancy of the institution), where the total transaction and production costs are the smallest. If a better institution appears (a unit positively verified and checked by the market, having a positive image on the B2B market), the transaction costs are reduced, which means moving down the cost function, shown in the figure. As a result, production costs are reduced and the production optimum increases to point *B1*. It should also be remembered that with the increase in the size of the enterprise, the average costs of production are decreasing, but also the transaction costs are growing. Each company should aim to reduce transaction costs. However, there are such costs that you always have to bear, such as the costs of obtaining information about contractors (outsourcers). Enforced cost reduction may negatively affect the effectiveness of the company [Trocki 2001].

Thus, the mutual comparison of production costs and transaction costs gives the opportunity to determine the right size of production. In practice, this is not an easy process, as there are serious problems

with the operationalization of transaction costs, which Hardt points out [2009]. It can be seen that the larger the enterprise, the lower the average production costs, assuming the use of labor-saving and more efficient production technologies.

However, labor-saving technologies are very capital-intensive and therefore inaccessible to the majority of enterprises characterized by the small scale of their operations. Such technologies can be effectively used for production purposes by large enterprises or by entities providing specialized services for smaller enterprises. The essence of implementation of progress in small and medium-sized entities is to cross the barrier of technical and economic opportunities. This enables the use of the outsourcing concept in practice.

CONCLUSIONS

1. Based on the analysis of articles available in the EBSCO database, starting from the 1980s, there is a dynamic increase in interest in the subject of transaction costs and outsourcing among scientists.
2. The optimal size of the enterprise corresponds to the production volume at which the transaction function indicates the decreasing level of their marginal product, until the value reaches 0.

3. With a high specificity of the company's resources, which requires the use of specific technologies, there are transaction costs on this account that shape the price of the goods being the subject of the transaction. Thus, when further increasing the size of the production company, you should also take into account the added transaction costs, among others, control and monitoring of transactions.
4. Modern enterprises focus their actions on key areas of activity. They give up production of what outsourcing providers can do more effectively, leaving what is specific for a given product, determining the company's identity and the essence of production.
5. A certain limitation of the presented research is the lack of empirical verification. However, this is another stage, which the author undertakes to verify the considerations presented in the article based on the research sample of small enterprises.

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PROBLEM OPTIMALNEJ WIELKOŚCI PRODUKCJI PRZEDSIĘBIORSTWA W ŚWIETLE TEORII KOSZTÓW TRANSAKCYJNYCH I PRAKTYKI OUTSOURCING

STRESZCZENIE

Celem artykułu było określenie znaczenia korzystania z zewnętrznych zasobów (z ang. *outsourcing*) oraz scharakteryzowanie towarzyszących temu kosztów transakcyjnych w procesie optymalizacji struktur przedsiębiorstwa. Praktycznym odniesieniem tak przyjętego celu badawczego było wskazanie optymalnych rozmiarów przedsiębiorstwa. Wskazanie na podstawie analizy literatury przedmiotu wpływu teorii kosztów transakcyjnych na rozwój działalności outsourcing.

Optymalna wielkość przedsiębiorstwa odpowiada takiej wielkości produkcji, przy której funkcja transakcji wskazuje na malejący poziom ich produktu krańcowego, aż do osiągnięcia wartości 0. Przy znacznej swoistości zasobów przedsiębiorstwa, wymagających zastosowania konkretnych technologii, pojawiają się koszty transakcyjne z tego tytułu, które ostatecznie kształtują cenę dobra będącego przedmiotem transakcji. Tak więc przy dalszym zwiększaniu rozmiarów produkcji przedsiębiorstwa należy również uwzględnić dodatkowe koszty transakcyjne, m.in. kontroli czy monitorowania transakcji. Współczesne przedsiębiorstwa koncentrują swoje działania na kluczowych obszarach aktywności. Rezygnują więc z produkcji tego wszystkiego, co mogą zrobić bardziej efektywnie dostawcy zewnętrzni, tzw. outsourcingowi, pozostawiając to co jest dla danego wyrobu specyficzne, decydujące o tożsamości firmy i o istocie produkcji.

Słowa kluczowe: koszty transakcyjne, outsourcing, wielkość produkcji w przedsiębiorstwie

EFFICIENCY OF NON-LIFE INSURANCE COMPANIES AND ITS DETERMINANTS

Sylwester Kozak  

Warsaw University of Life Sciences – SGGW

ABSTRACT

The research evaluates efficiency of non-life insurance companies in Poland from 2002 till 2016 and determines factors affecting it. The stochastic frontier analysis (SFA) method was applied for estimating cost efficiency of 29 insurance companies and the panel data Tobit model for identification of the efficiency determinants. The results of the research showed significant volatility of companies' efficiency scores changing from 62.5% in 2002 to 65.8% in 2007 and 59.4% in 2016. Efficiency of most companies was low and the average for the sector was driven by a small group of the most efficient entities. The efficiency was positively impacted by the value of company's gross written premium and acquisition costs, an increase in the profitability and the average wage in the non-life insurance sector and a decrease in the sector's concentration. Companies operated more efficiently in the environment of declining rates of the economic growth and inflation. These relationships were relevant for the entire sector, as well as for groups of companies characterized with higher and lower efficiency.

Key words: Poland, non-life insurance, cost efficiency, stochastic frontier analysis

INTRODUCTION

The sector of insurance companies of the section II¹ provides such important financial services as insurance of cars, air and sea vessels, commercial and residential property, civil liability, financial risk, guarantees and other types of insurance of business operations. At the end of 2016, the value of the sector's assets amounted to PLN 82 billion and constituted about 4% of the financial system assets [NBP 2017]. The dominant group of services offered by the sector is the motor insurance,

i.e. car comprehensive insurance and insurance of civil liability resulting from a car possession. The gross written premium (GWP) for this type of insurance accounts for about 60% of the sector's GWP².

In recent years non-life insurance has become an intrinsic part of the process of lending for residential and commercial real estate, as well as lending to enterprises as banks require insuring assets which serve as collateral for the loan claims. In addition, the need for protection against catastrophic risk, financial risk or civil liability causes that non-life insurance plays an important

¹ According to the Act of 22 May 2003 on insurance activity in Poland the insurance sector is divided into two sections. The section I provides life insurance and the section II other personal and property insurance. Hereafter the non-life insurance sector stands for the sector which offers insurance classified in the section II.

² The share of premium for car comprehensive insurance and insurance of civil liability resulting from a car possession remained in the range from 64% in 2002 to 56% in 2016 [PIU 2012, 2017].

role in management of enterprises. For these reasons, the efficient operation of non-life insurance companies is vital for the stability and profitability of the corporate sector and the state of household budgets.

In the last two decades, non-life insurance companies in Poland experienced some development opportunities as well as limitations in running their business operations. Poland's accession into the EU significantly expanded the possibilities to acquire new foreign capital investors, new technologies and customers, among others, enterprises set up by foreign corporations. The improvement of economic situation at that time was conducive to increasing the insurance premium. In turn, the indirect negative impact on the Polish economy coming from the global financial crisis of 2007–2009 and the crisis of public finances in the euro area significantly weakened the demand of corporations for property and liability insurance.

Competition in the sector, to some extent represented by the market concentration, also significantly impacted the performance of insurance companies and their efficiency. Excessive competition, especially recorded in the motor insurance segment in 2012–2015, was considered as the main reason for the deterioration of companies' earnings and an important source of risk for their stable operation [NBP 2015]. The decline in sector's profitability was so serious that in September 2015 the Polish Financial Supervision Authority (PFSA) called on insurance companies to adjust the prices of motor insurance policies to cover their costs. The PFSA action contributed to a significant increase in prices and value of collected motor insurance premium in the next year [UOKiK 2018].

The importance of the non-life insurance for the corporate sector and household budgets justifies the validity of the problem of assessing efficiency of non-life insurance companies and determination factors which affect its level. The analysis covers 29 insurance companies operating in Poland between 2002 and 2016 and is conducted on the basis of financial data of individual insurance companies published by the Polish Insurance

Association (PIU), the PFSA and the economic information platform – EMIS (www.emis.com). The macroeconomic data are provided by the Central Statistical Office (CSO). The Stochastic frontier analysis (SFA) was applied for the cost efficiency estimation and the panel data Tobit model with random effects for identification of factors impacting companies' efficiency.

The remaining part of this article has the following structure. The next section presents the situation of the non-life insurance sector in Poland, followed by the results of the literature review, and finally the data, methods and results of the research. The entire study is summarized in the conclusions.

NON-LIFE INSURANCE SECTOR IN POLAND

During the years 2002–2016 the number of operating non-life insurance companies decreased from 36 to 33. The substantial changes in the number took place before Poland's accession into the EU and had a significant impact on the sector's concentration calculated by the value of GWP (Fig. 1). The non-life insurance market was strongly concentrated in Poland. The share of the largest company (PZU) in the sector's GWP ranged from 56% in 2002 to 33% in 2016.

In the years 2002–2016 the non-life insurance sector comprised of about 20 and 10 entities controlled, respectively, by foreign and domestic investors. Initially the highest share in the sector's GWP was held by domestically-controlled companies (about 62% in 2002). However since 2009 the sector has become dominated by the foreign-controlled companies and their share in the sector's GWP rose to 59% in 2016. The majority of non-life insurance entities operated as joint-stock companies and their share in the sector's GWP ranged from 99% in 2002 to 94.5% in 2016. The remaining part of the non-life market was covered by mutual insurance companies³.

The value of the non-life insurance GWP was systematically growing, except for the years 2011–2015, when companies intensively competed on the motor

³ The number of companies controlled by foreign investors changed from 22 in 2002 to 20 in 2007 and to 21 in 2016. The number of companies with the status of a joint-stock company decreased from 30 in 2002 to 25 in 2016. The remaining companies operate in the form of a mutual insurance company – TUW; the data based on statistics of the PSFA (https://www.knf.gov.pl/?articleId=57191&p_id=18).

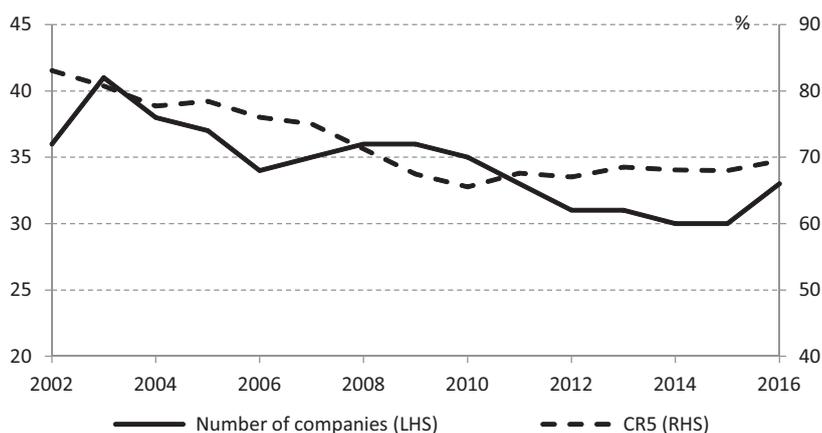


Fig. 1. Number of operating non-life insurance companies and the CR5 concentration ratio in Poland in 2002–2016
Source: Annual reports of the PIU.

insurance market, often underestimating the price of insurance policies. The PFSA warning of 2015 on the risk coming from the underestimation of insurance policy prices contributed to a significant increase in the premium in 2016. The value of the sector's assets was significantly affected by the companies' current activity, as well as the yield on Treasury bonds, which serve as their basic investment tool. Significant increase in the yield on five- and ten-year Treasury bonds in 2004 and 2009 to levels of around 7.5% and 6.4%, respectively, contributed to a reduction in the value of the bond portfolio and the value of non-life sector's assets. The profitability of the non-life insurance sector was considerably variable. The ROA rose from 3.9% in 2003 to 9.8% in 2006 and gradually decreased to 2.4% in 2016.

LITERATURE REVIEW

The efficiency of insurance companies has recently become the subject of many studies and is gaining considerable interest among economists. Most of the research was done on insurance companies operating in the highly developed countries, mainly in the USA and EU countries. Among others, Weiss [1991] using the SFA method and analyzing about 100 insurance companies in the USA in the years 1980–1984, stated that their technical efficiency level ranged from 67 to 88%. Bikker and van Leuvensteijn [2008] assessing efficiency of approximately 100 life insurance compa-

nies in the Netherlands with the SFA method in the period 1995–2003 found that the average cost efficiency in the sector was around 75%. The study of Cummins and Rubio-Misas [2006] showed that cost efficiency of the Spanish insurers in 1998 was relatively low and equaled to 30%.

However some differences in the efficiency scores can be noticed in studies about the same insurance industry. Fenn et al. [2008], using the SFA method, assessed the cost efficiency of the non-life insurance companies in the Netherlands at the average level of 94%, while Rai [1996], using the same method, found that efficiency of the overall Dutch insurance industry in the period 1988–1992 amounted to 63%. Some discrepancies appear when different methods are applied. Cummins and Zi [1998] and Eling and Luhnen [2010] based on the analysis of the insurance companies operating, respectively, in the USA in 1988–1992 and in 36 countries in 2002–2006 noticed that the efficiency assessments obtained by the SFA method were usually higher than those of the DEA method.

Another group of studies refer not only to the estimation of the insurance companies' efficiency, but also identify factors impacting it. Eling and Luhnen [2010] showed that the value of efficiency was negatively impacted by the size of the insurance company and positively by the level of its solvency. Cummins and Weis [1993] found that efficiency of the US property insurance companies in 1980–1988 depends on the value of companies' assets. The cost efficiency scores of larger

entities equaled to 90%, while the small and medium-sized entities 80%. Similarly Donni and Fecher [1997] found the technical efficiency in 15 OECD insurance industries in 1983-1991 was positively impacted by the company's market share. The positive impact of the company's asset on the efficiency showed Davutyan and Klumpes [2008] testing insurance sector in the major European markets. Based on the research on the Polish non-life insurance companies in 2003–2007 Kozak [2010] noticed the positive impact of the GDP growth and the reduction of operating costs on companies' efficiency. In addition, no relationship between the level of efficiency and the value of the company's GWP was found.

METHOD AND RESULTS OF THE RESEARCH

The idea of economic efficiency has its source in the microeconomic theory of the enterprise. It employs the concept of a production frontier. Two methods are used to determine the frontier and the level of efficiency: nonparametric and parametric. The most frequent option of the first one is the data envelopment analysis (DEA) developed by Charnes, Cooper and Rhodes [1978]. The most common version of the parametric methods is the stochastic frontier analysis (SFA), which was formulated by independent research groups, including Aigner et al. [1977] and Meeusen and van den Broeck [1977].

In the current study the SFA method was applied. The cost frontier is described by the trans-logarithmic function (eq. 1). The function requires a linear homogeneity of input prices and the symmetry of second-order factors. To meet these conditions, the cost function for one output and two inputs is transformed into the form [Parmeter and Kumbhakar 2014]:

$$\ln\left(\frac{TC_i}{p_{2i}}\right) = \alpha_0 + \beta_1 \ln y_i + \frac{1}{2}\beta_2 (\ln y_i)^2 + \beta_3 \ln\left(\frac{p_{1i}}{p_{2i}}\right) + \frac{1}{2}\beta_4 \left(\ln\left(\frac{p_{1i}}{p_{2i}}\right)\right)^2 + \beta_5 \ln y_i \ln\left(\frac{p_{1i}}{p_{2i}}\right) + \beta_6 M_i + \mu_i + \eta_i \quad (1)$$

where for the company i :

- TC_i – total operating cost;
- y_i – assets;
- p_{1i}, p_{2i} – prices of labor and capital;
- M_i – dummy variable referring to specialization in motor insurance,
- μ_i – non-negative cost inefficiency,
- η_i – random error,
- $\alpha_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ – parameters to be estimated.

The variable M_i is introduced to control for the essential characteristic of some non-life companies – specialization in motor insurance. The variable M_i equals 1 when the company i obtains more than 50% of the GWP out of the motor insurance (i.e. car comprehensive insurance and insurance of civil liability resulting from car possession) and 0 otherwise. Following Bikker and Leuvensteijn [2008] the prices of inputs, i.e. labor and capital, are specified, respectively, as the ratio of administrative costs to total assets and the ratio of acquisition costs to the GWP.

The current analysis covers 29 insurance companies operating in Poland in the years 2002–2016. Statistics describing individual, sectoral and macroeconomic variables used for the research are presented in Table 1. The data indicate that companies differ in terms of the value of their assets, and administrative costs and acquisition costs incurred for their operations. Additionally, it can be noticed that they operate in the significantly volatile macroeconomic and sectoral conditions with considerable amplitude of changes in rates of the GDP growth and inflation.

In the first stage of the research the cost efficiency scores were assessed. The results of estimation of the trans-logarithmic cost frontier (eq. 1) with the time-variable efficiency option are presented in Table 2.

Based on the cost frontier estimation, the scores of insurance companies' efficiency were determined (Table 3). They indicate that throughout the entire period the efficiency of individual companies was strongly diversified. The average difference between the maximum and minimum efficiency scores amounted to 76 percentage points (p.p.) and the average interquartile range 22.8 p.p. The biggest difference between the highest and the lowest efficiency scores occurred before the outbreak of the global financial crisis (77 p.p.)

Table 1. Descriptive statistics of variables used in the study

Variable	Number of observations	Average	Standard error	Minimum	Maximum
Assets (PLN thou.)	389	2 090 000	5 910 000	13 607	37 300 000
GWP (PLN thou.)	389	886 000	1 850 000	572	10 800 000
Acquisition cost (PLN thou.)	389	173 000	308 000	66	1 870 000
Administrative cost (PLN thou.)	389	81 589	200 000	257	1 300 000
Acquisition cost to GWP	389	0.26	0.22	0.01	2.13
Administrative cost to assets	389	0.07	0.07	0.001	0.43
M	389	0.53	0.50	0	1
CPI (%)	15	101.94	1.71	99.05	104.27
GDP growth (%)	15	103.68	1.51	101.40	107.00
Wage (PLN)	15	4 114	1 005	2 328	5 197
ROE (%)	15	16.35	5.23	8.90	29.10
CR5 (%)	15	0.72	0.05	0.66	0.83

GWP – gross written premium, M – specialization in motor insurance, Wage, ROE and CR5 respectively, average monthly wage, rate of return on equity and the share of five largest companies in the non-life insurance sector.

Source: Own calculations based on the CSO, the PIU and the PSFA data.

Table 2. Results of the trans-logarithmic cost frontier estimation

Variable	Coefficient	Standard error	z-stat.	$P > z$
$\ln y$	1.721 ^a	0.288	5.97	0.00
$(\ln y)^2$	-0.046 ^a	0.017	-2.76	0.01
$\ln(p_1/p_2)$	0.085	0.263	0.32	0.75
$[\ln(p_1/p_2)]^2$	0.077 ^a	0.022	3.55	0.00
$\ln y \cdot \ln(p_1/p_2)$	0.036 ^b	0.016	2.17	0.03
M	0.922 ^a	0.229	4.02	0.00
Constant	-3.970 ^a	2.476	-1.60	0.11
N (groups)	360 (29)	×	×	×
Wald $\chi^2(6)$	803.93	×	×	×
Prob. $> \chi^2$	0.000	×	×	×

a, b – statistical significance at the level of 1%, 5%, respectively.

Source: own calculations based on the CSO, the PIU and the PSFA data.

and the smallest in 2011–2016 (75 p.p.). In case of the first period the distribution of the efficiency scores could be explained by the extensive foreign investments and the entrance of foreign companies using advanced technologies and management strategies.

The second period was characterized by the intensive competition on the motor insurance market, when the market was driven by the price strategy of the largest insurance company controlling approximately 35% of the market.

Table 3. Distribution of the non-life insurance companies' efficiency scores (%)

Year	Minimum	Quartile 1	Median	Quartile 3	Maximum
2002	5.6	9.9	23.8	31.6	82.7
2003	6.0	10.2	23.1	31.6	83.0
2004	6.4	10.7	23.9	32.5	83.4
2005	6.8	11.3	25.0	34.6	83.8
2006	7.3	11.9	25.8	35.5	84.1
2007	7.7	12.8	26.4	35.9	84.4
2008	8.2	13.1	26.9	36.4	84.8
2009	8.7	13.8	24.1	36.2	85.1
2010	9.2	14.4	25.0	37.1	85.4
2011	9.8	15.1	29.5	37.8	85.7
2012	10.3	15.8	30.3	38.7	86.0
2013	10.9	16.5	31.2	39.5	86.3
2014	11.5	17.2	32.0	40.4	86.6
2015	12.1	17.9	32.9	41.3	86.9
2016	12.7	18.7	33.8	42.1	87.2

Source: Own calculations based on the CSO, the PIU and the PSFA data.

In 2002–2016, the overall level of the insurance companies' efficiency increased. The minimum efficiency in the sector increased by 7.1 p.p. while the maximum only by 4.5 p.p. Additionally, the median for the sector increased by 10 p.p., which indicates that the group of the medium non-life insurance companies significantly improved their efficiency. The lowest improvements were achieved by the dominant insurance company, what put downward pressure on the efficiency of the group of large companies.

The distribution of efficiency scores shows that most of Polish non-life insurance companies operated with relatively low efficiency. High sector's average scores were driven by a few highly efficient large entities. Throughout the entire period the efficiency scores of three quarters of companies did not achieve even a half of the efficiency scores of the largest company in the sector.

The goal of the second stage of the research was to determine factors impacting the efficiency level. The relationship between individual, sectoral and

macroeconomic variables and efficiency scores was tested with the panel data Tobit regression with random effects and the formula:

$$Z_i = \alpha_0 + \beta_j h_{i,j} + \gamma_t m_k + e_i \quad (2)$$

where:

- Z_i – efficiency score of the insurance company i ;
- $h_{i,j}$ – variable j specific for the company i ;
- m_k – the sectoral and macroeconomic factor k ,
- e_i – random error;
- $\alpha_0, \beta_j, \gamma_t$ – coefficients to be estimated.

The results of the estimation indicate that efficiency is positively impacted by the increase in the scale of the company's operation measured by the GWP and the increase in the ratio of acquisition costs to the GWP (Table 4). Such relationships indicate that larger companies have better opportunities to improve efficiency by taking advantage of the economy of scale and reduction of operation costs. The positive impact of increasing acquisition costs suggests that expansionary

Table 4. Determinants of the efficiency of the non-life insurance companies

Variable	Full sample			Below efficiency median			Above efficiency median		
	coeff.	SE	z-stat.	coeff.	SE	z-stat.	coeff.	SE	z-stat.
Ln_GWP	0.006 ^a	0.001	3.83	0.007 ^a	0.001	4.77	0.007 ^a	0.003	2.68
Acquisition/ GWP	0.010 ^a	0.004	2.37	0.002 ^a	0.004	0.61	0.013	0.009	1.54
Ln_CPI	-0.979 ^a	0.053	-18.59	-0.838 ^a	0.060	-13.95	-1.071 ^a	0.078	-13.71
Ln_GDP	-0.293 ^a	0.057	-5.15	-0.265 ^a	0.062	-4.28	-0.315 ^a	0.085	-3.70
Ln_Wage	0.129 ^a	0.012	10.38	0.115 ^a	0.013	8.58	0.140 ^a	0.019	7.38
ROE	0.001 ^a	0.000	2.85	0.001 ^c	0.000	1.73	0.001 ^b	0.000	2.16
CR5	-0.201	0.033	-6.13	-0.144 ^a	0.036	-4.00	-0.234 ^a	0.049	-4.75
Constant	4.508 ^a	0.246	18.31	3.828 ^a	0.280	13.66	4.826 ^a	0.359 ^a	13.45
N	360			360			360		
Groups	29			29			29		
Wald $\chi^2(7)$	2520.5			1423.4			1369.3		
Prob > χ^2	0.00			0.00			0.00		

Ln_GWP – logarithm of GWP, Acquisition/GWP – acquisition costs over GWP, Ln_CPI – logarithm of CPI, Ln_PKB – logarithm of GDP growth, Ln_Wage – logarithm of the average wage in the insurance sector, ROE and CR5 – ROE and CR5 for the non-life insurance sector; a, b, c – statistical significance at the level of 1%, 5%, 10%, respectively.

Source: own calculations based on the CSO, the PIU and the PSFA data.

strategy backed by rising costs of promotion and remuneration for insurance agents could bring positive effects on the value of collected GWP and enhance the overall efficiency.

Stable economic conditions are more suitable for the growth in efficiency of the non-life insurance sector. Companies operate more efficiently in the environment of greater price stability and declining rate of the GDP growth, what is consistent with results of Kozak [2010]. Such relationships could result, among others, from changes in valuation of the Treasury bond portfolio, the main investment vehicle for non-life insurance companies. With the decline in the inflation rate, the value of the Treasury bond portfolio usually increases, what improves the company's financial performance.

However, a fall in the rates of inflation and the GDP growth could be also the symptoms of deteriorating economic situation in the country and an increase in risk in the enterprise and household sectors. Such situation justifies insurance companies to increase the

value of premium to compensate for the risk and to improve their overall performance.

The intra-sector factors have also a significant impact on the efficiency of insurance companies. They operate more efficiently when profitability of the entire sector is improving and wages in the sector are rising. In turn, a positive reaction of efficiency to the decreasing concentration of the sector indicates that higher competition improves efficiency of the sector. This means that the non-life insurance sector follows the Efficiency Structure paradigm which states that more efficient and more competitive entities eliminate less effective competitors from the market and thus increase their market share and at the same time increase the overall efficiency of the sector. Such thesis could be supported by the fact that during analyzed period, the number of operating entities decreased and, at the same time, the efficiency of companies significantly increased (Table 3). It means that some of the least efficient companies were forced to exit the market or to merge with other more efficient entities.

CONCLUSIONS

The efficiency scores of the non-life insurance companies in Poland in the years 2002–2016 had an upward trend. The higher pace in the efficiency occurred in the group of medium-efficient companies and the lowest in group of the largest companies in the sector. Most insurance companies, however, were characterized by the low efficiency and their efficiency scores did not achieved even a half of the score of the largest company in the sector.

The research showed that the increase in the value of company's GWP and acquisition costs related to the GWP had a positive impact on the increase in efficiency. Higher efficiency was supported by sectoral factors, i.e. rising profitability and average wages in the sector, as well as an improvement in competition resulting from the lowering of the sector's concentration level. In addition, non-life insurance companies achieved higher efficiency in the context of declining rates of the GDP growth and inflation.

The above mentioned factors in a similar way contributed to the improvement in efficiency of the entire sector and two groups of companies – with higher and lower efficiency.

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EFEKTYWNOŚĆ ZAKŁADÓW UBEZPIECZEŃ MAJĄTKOWYCH I JEJ DETERMINANTY

STRESZCZENIE

Artykuł prezentuje ocenę efektywności 29 zakładów ubezpieczeń majątkowych w Polsce w latach 2002–2016 oraz wyznacza czynniki ją kształtujące. Do oszacowania efektywności wykorzystano metodę SFA, a model Tobita do identyfikacji jej determinant. Badania wskazały, że efektywność charakteryzuje się znaczną zmiennością, a jej wartości zmieniają się od 62,5% w 2002 r. do 65,8% w 2007 r. i 59,4% w 2016 r. Efektywność większości zakładów była mała, a średnia w sektorze była podwyższana wynikami niewielkiej grupy najbardziej wydajnych podmiotów. Na efektywność pozytywnie wpłynęła wartość pozyskiwanej przez zakład składki oraz ponoszonych przez nią kosztów akwizycji, wzrost rentowności i przeciętnego wynagrodzenia w sektorze ubezpieczeń majątkowych oraz spadek koncentracji sektora. Firmy działały efektywniej w środowisku obniżającej się dynamiki wzrostu PKB i stopy inflacji. Relacje te były istotne dla całego sektora, a także dla grup firm charakteryzujących się większą i mniejszą efektywności.

Słowa kluczowe: Polska, ubezpieczenie majątkowe, efektywność kosztowa, metoda SFA

THEORY OF CONTRACTS IN THE LIGHT OF NEW INSTITUTIONAL ECONOMICS. THE SPECIFICITY OF AGRICULTURAL CONTRACTS

Marzena Lemanowicz  

Warsaw University of Life Sciences – SGGW

ABSTRACT

The article reviews Polish and foreign economic literature regarding new institutional economics (NIE) and various research approaches used in the framework of NIE. Particular attention was paid to the economic theory of contracts and the transaction costs, as the limitation of transaction costs is indeed the main stimulus for contract signing. Special attention was given to agricultural contracts and their specificity. The article discusses different theories applied in the analysis of contracts, characterizes contracts according to different criteria, and draws attention to the importance of transaction costs in the theory of contracts. In addition, factors which contribute to these costs have been identified, indicating the necessity of adapting the principles of transaction cost economics to the needs of the agricultural sector.

Key words: new institutional economics, contracts, agricultural contracts, transaction costs

INTRODUCTION

For nearly 30 years, Polish agriculture has undergone numerous transformations. The functioning of agriculture and its connections with the surroundings were significantly affected by the introduction of market economy after 1989 and Polish accession to the European Union. Add to this many transformations associated with changes in the supply changes of agricultural and food products, breaking of cooperative ties after 1990, development of retail chains, high concentration of food industry compared to agricultural production, and introduction of high quality expectations at all levels of the food chain. All this means that Polish agriculture now has to build up a competitive position from scratch, compounded by the asymmetry of market power between agricultural producers and agricultural and food processing companies or retail chains. Which is why the question of agricultural contracts and the

need of further development of contracting in farming is being reassessed.

The general aim of this paper is to characterise various study approaches used to interpret and explain the contract theory in the new institutional economics (NIE) framework. Particular aims boil down to:

- discussion of various theories applied in the analysis of contracts;
- the characterisation of contracts with special reference to agricultural contracts and the factors which favour signing agricultural contracts;
- the identification of main contract types with particular reference to those present in the agricultural market;
- the characterisation of transaction costs accompanying contracts;
- identification of factors which contribute to generating transaction costs.

MATERIAL AND METHODS

The deliberations below are purely theoretical. For the purpose of this paper, a review was carried out of both Polish and foreign economics literature concerning new institutional economy (NIE) and various research approaches used within its framework. The economic theory of contracts and transaction cost economics were paid particular attention, as the limitation of transaction costs is indeed the main stimulus for contract signing. Then, special attention was given to agricultural contracts, their specificity, and the necessity of adapting the principles of transaction cost economics to the needs of the agricultural sector. The starting point of the theoretical deliberations presented in this paper is the 1937 article by Coase, which contributed to the rising interest in transaction costs and the later use of this approach in the analysis of economic phenomena.

NEW INSTITUTIONAL ECONOMICS – ORIGINS AND KEY CONCEPTS

The year recognised as the birth date of new institutional economy (NIE) is 1937, when Coase published his article entitled *The nature of the firm*. In it, Coase introduced the concept of transaction cost for the first time. Initially, the paper did not attract much interest among scholars and its impact on them was negligible [Coase 1993]. His theories aroused interest only in the 1960s and 1970s. Many economists began developing the transaction cost theory, and attempts were made to apply the new approach in the analysis of economic phenomena as well. In its early period of development, NIE sought to expand the application of the neoclassical theory. However, as a growing number of economists were becoming dissatisfied and critical towards the neoclassical models of production and exchange [Furubotn and Richter 2003], according to Williamson new institutional economics grew from the positive critique of orthodox economics [Williamson 2000, Daniłowska 2007]. It was Williamson who put the expression new institutional economics into circulation in his 1975 book titled *Markets and Hierarchies* [Williamson 1975]. The moniker “new” was meant to distinguish the NIE method from the so-called old

institutional economics, represented by such economists as Veblen, Commons, Mitchell, and Ayres [Kowalska 2005].

New institutional economics (NIE) is a wide area of research and, as stressed by Hockuba [2001], it is not entirely methodologically uniform. Some of the most important study programmes within NIE include the following [Williamson 1985, 1998, 2000, Furubotn and Richter 1997, Iwanek and Wilkin 1997, Hockuba 2001]:

1. The economic theory of contracts and agency theory, which are involved in the issue of information asymmetry and the formulation of contracts, to make the stimulus structure and methods of enforcing contractual rights and obligations contained therein contribute to the realisation of contractual partners' goals.
2. Transaction cost economics, which focuses on the transaction cost category and questions of contract execution.
3. The theory of property rights, which analyses the impact of the property-right structure on the economy.
4. The economics of public choice, which applies the research methods of neoclassical economics to analyse the functioning of public institutions such as governments, parliaments, public organisations, etc.
5. Constitutional economics and political economics.

The economic theory of contracts and transaction cost economics, where contract is the basic unit of study, are the most significant for the purposes of this paper. Besides such concepts as contract or transaction cost, institution is a key concept in NIE. The most popular and most frequented definition comes from North [1990], who wrote that “institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. (...) Institutional constraints include both what individuals are prohibited from doing and, sometimes, under what conditions some individuals are permitted to undertake certain activities”. Institutions can be both informal (sanctions, taboos, customs, traditions) and formal (laws, property rights, contracts). Though in ordinary language the concepts of institution and organisation are frequently identified, institutionalists

point out their different semantic scopes. Organisations are founded to realise and enforce institutions [Gancarczyk 2002]. Thus, should institutions be defined as game rules, organisations can be considered as the makers of new rules of the game.

APPROACH TO CONTRACTS IN NEW INSTITUTIONAL ECONOMICS

New institutional economics and its four pillars: the transaction cost theory, the theory of agency, the theory of property rights, and the theory of public choice, adopted transaction as the basic unit of analysis. A transaction with a clearly outlined structure in which the transactors assume specific obligations can be referred to as a contract [Masten 2000]. From the point of view of economics, a contract is viewed as an agreement between at least two parties (partners, contractors, agents) with regard to their mutual obligations relating to a given exchange relationship [Malchar-Michalska 2018]. According to Furubotn and Richter, a contract can be understood as a bilateral transaction in which both parties agree on their obligations. Beside the agreement between parties regarding their relations, the presence of legal sanctions (legal enforcement) is considered as a characteristic trait of a contract [Iwanek and Wilkin 1997]. The adoption of transaction as the basic unit of analysis in NIE is a different perception of a firm. In institutional economics firms are treated as bundles of contracts in a specified regulation structure. The entrepreneur concludes contracts with employees, contractors, suppliers, and recipients. Consequently, firms may arise which function exclusively on the foundation of external firms which realise the main operations and whose role is limited to coordinating specific activities. The comparison of transaction costs is the basis of choice. The firms that accede to an agreement include in it the attributes of the transaction: the specificity of assets, frequency and uncertainty, the intensity of which affects the granularity of a contract and, in consequence, the level of transaction costs [Tyc and Schneider 2017, after Williamson 1998]. Contract analysis commonly uses transaction cost economics and agency theory. Emphasising the occurrence of transaction costs which, contrary to the neoclassical

theory, are greater than zero, should be credited to Coase (the author of *The Nature of the Firm*). Coase argued that every transaction concluded in the economy is accompanied by various costs which, as a sum, correspond to friction forces in a physical system. Williamson [1998] divided transaction costs into ex ante costs – associated with preparing, negotiating, and securing the agreement, and ex post costs – arising from the inadequacies of the agreement and the ensuing need to resolve disputes, renegotiate, control, etc. Another division is the concept proposed by North and Wallis [1986] who differentiate measurable and measurable costs. Not all expenses related to a transaction can be presented with a monetary value, therefore they are not included in measurable costs. For example, the time taken to prepare a transaction is difficult to estimate, but it is undoubtedly a transaction cost. Both approaches – Williamson and North, Wallis are complementary to each other. Hardt [2008] also emphasizes that various contracting phases involve different types of transaction costs. There are three main periods in the contract business: the preliminary period during which the company sees an opportunity to make a profit; the initial period in which the parties adapt their internal structures to the new conditions; and the contracting period, i.e. the time in which the exchange is carried out on the terms specified in the contract. Furubotn and Richter [2000] distinguish market transaction costs, managerial transaction costs, and political transaction costs. Among market transaction costs they include the costs of preparing a transaction (e.g. costs of looking for partners, communication costs, promotional costs), costs of the final contract: the costs of negotiating and making the decision, costs of monitoring and performance of contractual obligations. Managerial transaction costs may include the costs of creating, maintaining, and changing organisation plans as well as the costs of operating the firm (decision-making costs, monitoring of order fulfilment, information management costs, etc.). Political transaction costs are not relevant for this paper. Generally speaking, transaction costs do not have a clear definition in the theory of contracts. What is more, operationalising transaction costs and thus finding an unambiguous method to measure them is a significant problem. Just to isolate

transaction costs from the entire costs of a firm is wrought with difficulty, and, when we are finally able to isolate these costs, we usually use the comparative institutional analysis method.

As Williamson [1998] claims, limited rationality, opportunism, and specificity of assets are the main factors which contribute to generating transaction costs, while signing contracts is a method to reduce transaction costs. Limited rationality is a characteristic of the discrepancies in information held by the parties to a contract. Opportunism is revealed by taking actions to the detriment of the other contractor, while specificity of assets may refer to location, quality, or knowledge.

The theory of agency, also used in contract analysis, tackles the issue of designing contracts. Two actors of an agency relationship – principal (employer, superior) and agent (contractor, subordinate) – engage in a partnership whose conditions are laid down in a contract. In an agency relationship, one or more persons, referred to as the principal (P), employ other persons, hereafter referred to as agents (A), to perform a service. It is accepted in the principal–agent model that one of the parties is characterised by holding imperfect information, while the other party holds information important for their mutual well-being. This model assumes that the party which has negotiation and information advantage will offer a contract to the other party. The one who offers a contract is called the principal, whereas the individual who accepts or rejects it becomes the agent. In the basic model, the principal is tasked with designing a remuneration system to motivate the agent to act in the interest of the principal. To formulate such a contract it is necessary to meet two conditions. One is the motivation correctness condition, which means that choosing the optimal effort (from the principal’s point of view) must be no less useful for the agent than choosing any other effort variant. The other is the participation condition, which means that the utility of working for the principal must be at least as high as the utility of working elsewhere [Mas-Collel et al. 1995, Kowalska 2005, after Varian 1990, 2001]. Gorynia [1999] indicated the following six determinants of the emergence of agency problems: diverging interests of P and A, uncertainty, imperfect ability to observe the agent’s behaviour, costs

of concluding and performing the contract, incompleteness of the contract, and asymmetry of information between P and A. With regard to the asymmetry of information, Rasmusen [2006] defined five main principal–agent models: moral hazard with hidden action, moral hazard with hidden knowledge/information, adverse selection, signalling, and screening. In each model the principal offers a contract which the agent accepts or refuses.

Game theory presents a different research approach to explaining contracts, relating to the situation of conflict between the parties to the contract under the so-called bargaining problem. Bargaining is treated as a situation of a conflict with at least two participants who have various antagonistic and non-antagonistic goals and abilities to choose available actions. Prisoner’s dilemma is the classic example of a game which is perfectly suitable to model contractual relations. It is a two-player game, in which each player can gain by betraying her opponent, but both will lose if they betray each other. This dilemma is a non-cooperative (partial conflict) non-zero sum game, as the conflict strategy is advantageous compared to the peaceful strategy. One can gain the most by betraying and lose the most by cooperating [Tyc and Schneider 2017].

The research approaches used to explain contracts notwithstanding, various types of contracts are also important. According to authors belonging to various schools of new institutional economy, different traits are crucial in determining the shape of the contract. According to transaction cost theory, transactions are characterised by the following three features: uncertainty, frequency, and specificity of assets. One fundamental division involves complete and incomplete contracts, where the former type does not exist in the real world. In incomplete contracts the asymmetry of information between the parties to a contract is assumed, there is an initial independence of parties, the limited rationality of parties to a contract makes it impossible to provide for all issues related to the rights and obligations of parties, opportunistic behaviour of parties is assumed, as well as the option to renegotiate the conditions of a contract [Stankiewicz 2012]. Therefore, the “incompleteness” of a contract is mostly due to the limited rationality of economic entities and the inability to control some of the

variable circumstances involved in the performance of a contract [Saussier 2000]. Applying the criterion of transaction dimensions, Williamson [1998] distinguishes between classical, neoclassical, and relational contracts (forbearance law). These contracts differ with regard to duration, frequency, personal interactions, prolongation mechanisms, definitions of obligations, etc. The classical contract is used when the dependency between parties is weak or non-existent. Such is the case when the asset specificity level is low, and the ease of finding alternative solutions makes the contract renewable at low cost. The duration of the contract is short, and the price becomes the key variable for coordination and the transfer of rights. A neoclassical contract takes place when the specificity of assets is high enough to form a mutual dependence between parties. The significance of contract duration increases, and the price is no longer a sufficient adjustment factor. The incompleteness of contracts makes the disputes more frequent and difficult to resolve. Relational contracts refer to long-term contracts of high specificity of assets, which creates a high interdependence between parties to a contract, while the risk of opportunism pushes towards integration. The contract is a framework aimed at sustaining the partnership – its essence is the relationship between parties, not the object of the contract. Furubotn and Richter point to marriage and employment contract as examples of relational contracts [Daniłowska 2007].

SPECIFICITY OF AGRICULTURAL CONTRACTS

The intensification of consolidation processes in agricultural and food processing and in the sector manufacturing the means of production, lead to the increase in importance of contracting in agribusiness. An agricultural contract can be defined as an agreement concluded between a farmer and a buyer, in which the parties undertake to sell and buy a specified amount of goods in the future under fixed principles [Eaton and Shepherd 2001]. Apart from contracting productions, agricultural producers can sell their products on the so-called spot market, where the transfer of resources between individual chain members is coordinated by market (spot) prices.

Minot [1986] distinguishes three types of contracts:

- Market-specification contracts, where the buyers secure outlets for agricultural producers, and such information as the quantity and quality of products, delivery dates, and, most importantly, prices are included in the contract.
- Production-management contracts where the contracting party, besides providing outlets for agricultural products, affects the methods of production of contracted goods (used plant protection products, sowing and harvesting dates).
- Resource-providing contracts where the contracting party not only provides outlets for agricultural products but also affects the production methods and provides agricultural producers with such means of production as seeds, fertilizer, or machines.

From these three types, the resource-providing contracts show the highest degree of control over agricultural producers and production. On the other hand, the risk incurred by agricultural producers in this type of contract is the lowest. The price of the product is a very important aspect in the topic of agricultural contracts. Sobańska [2004] defines four contract forms with regard to pricing arrangements: fixed-price contracts with prices which are not subject to any changes; fixed-price contracts with the option to renegotiate prices should economic indicators change; contracts with fixed price ranges which depend on the results achieved by producers; and fixed-price contracts with clauses clearly stipulating that product prices can be renegotiated.

Strzębicki [2013] notices that in an economy there are both the stimuli which contribute to contracting agricultural goods and those which do not favour its development. High quality requirements at all stages of the food chain, decreased risk of agricultural production and supplying food processing firms thanks to contracting, internalisation of production, and also the fact that contracting often leads to transferring knowledge from the contracting firm to the agricultural farm, can all be included among the important factors in favour of contracting. Whereas the factors that decrease farmers' readiness to sign agricultural contracts include direct payments according to cultivation area

and increasing storage capacity in farms. Moreover, there is a threat that large contracting firms may consider contracting as a means to exploit small farmers.

A crucial process taking place in agriculture, and significant to the issue of contracting, is the emergence of producer organisations which then become parties to the contracts concluded with agricultural and food processing companies or retail chains. Studies carried out by Malchar-Michalska [2018] indicate that fixed-price contracts with prices set in advance were predominant among agricultural contracts (71% of studied contracts). In 14% of contracts the motivating component was taken into account, using the “fixed price with a bonus for the quality or timeliness of deliveries”. A vast majority of the studied groups had signed contracts, with the producers of potatoes and milk characterised by the highest proportion of contracts as the form through which produce was transferred to the integrator. Conversely, groups active in the market of fruit and vegetables showed a high share of non-contractual transactions: about 26% of these groups sold their produce outside of contracts. This situation is also highly dependent on the specificity of agricultural raw products, as fruit and vegetables are products which can be more easily sold outside of a contract; what is more, groups have well prepared infrastructure they can use to store produce should it be required. Moreover, there are also informal ties between the groups and recipients in this market, based on many years of cooperation.

Issues relating to agricultural contracts should not be dealt with only in relation to agricultural commodities. Agricultural land, for example, may also be the subject of exchange. Interesting research in this area was carried out by Marks-Bielska [2014], drawing attention to the main factors which influence the sale of agricultural land in Poland.

It has been mentioned in the previous section that limited rationality, opportunism, and specificity of assets are the main factors which contribute to generating transaction costs, while signing contracts is a method to reduce these costs. These assumptions need to be reinterpreted with regard to the agricultural sector, and the principles of transaction cost economics also need to be adapted to the needs of the agricultural sector. According to Czernasty and

Czyżewski [2007], the assumptions which should be reinterpreted include:

- Limited rationality – the assumption of limited rationality seems to be of particular actuality in farming due to the uncertainty and risk of agricultural production, and low flexibility of supply and demand.
- Opportunism – in the case of the agricultural sector, opportunism does not flow from the ill will of the parties but from the existence of long production cycles, the uncertainty of results due to the natural conditions, and the unilateral dependence of agriculture on its environment due to the dominance of firms operating in the agricultural environment.
- Specificity of assets – in agricultural economics, it is first of all the specificity of location that is significant, physical specificity (of quality), and the specificity of agricultural knowledge, which corresponds to the specificity of human assets.

CONCLUSIONS

The article discusses contract theories according to the principles of new institutional economy. Various approaches used in contract analysis were highlighted, such as transaction cost economics, agency theory, and game theory. Transaction costs and contracts were characterized according to various criteria. An important aspect is the identification of factors contributing to the creation of transaction costs and the need to reinterpret them with regard to the agricultural sector. Agricultural contracts with their unique specificity were given particular attention. In the present-day economic situation, further development of contracting processes in agriculture is inevitable, as it provides certain benefits to both sides of the conflict. From the perspective of food industry enterprises, signing contracts, in particular resource-providing contracts or production-management contracts, gives them control over the production process, thus allowing them to ensure the appropriate quality of goods and continuity of supply. For agricultural producers, signing a contract is a means to reduce market risks and ensure outlets for the agricultural products they have produced. Another problem in the agricultural problem is the asymmetry between agricultural producers and food

processing enterprises which may contribute to the use of strength to affect the contracts being signed, making them less beneficial for agricultural producers. In spite of this fact, the author believes that the question of contracting on a larger scale should be considered again in Polish agriculture.

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TEORIA KONTRAKTÓW W ŚWIETLE NOWEJ EKONOMII INSTYTUCJONALNEJ. SPECYFIKA KONTRAKTÓW ROLNYCH

STRESZCZENIE

W artykule dokonano przeglądu polskiej i zagranicznej literatury ekonomicznej dotyczącej nowej ekonomii instytucjonalnej (NIE) i różnych podejść badawczych wykorzystywanych w jej ramach. Szczególną uwagę zwrócono na ekonomiczną teorię kontraktów oraz ekonomikę kosztów transakcyjnych, gdyż to właśnie ograniczenie kosztów transakcyjnych jest głównym bodźcem skłaniającym do podpisywania kontraktów. Istotną część pracy stanowią rozważania dotyczące kontraktów rolnych i ich specyfiki. W artykule omówiono różne teorie mające zastosowanie w analizie kontraktów, scharakteryzowano kontrakty według różnych kryteriów, a także zwrócono uwagę na znaczenie kosztów transakcyjnych w teorii kontraktów. Ponadto zidentyfikowano czynniki, które przyczyniają się do powstawania tych kosztów, wskazując na konieczność adaptacji założeń ekonomiki kosztów transakcyjnych dla potrzeb sektora rolnego.

Słowa kluczowe: nowa ekonomia instytucjonalna, kontrakty, kontrakty w rolnictwie, koszty transakcyjne

APPLICATION OF IT TOOLS IN MANAGING SMALL AND MEDIUM-SIZED ENTERPRISES IN THE CONTEXT OF CREATING ENTREPRENEURIAL ORIENTATION

Renata Lisowska  

University of Lodz

ABSTRACT

The presence of small and medium-sized enterprises on the Internet in the era of increasing global competition has become a necessity. These entities have begun to notice the benefits that can be obtained by using modern IT tools in various areas of their operations.

The aim of the paper is to analyse and evaluate the impact of the use of IT tools in various areas of SMEs' operations on creating their entrepreneurial orientation. The implementation of such a goal required, on the one hand, a literature review and an analysis of current research on the IT tools used by small and medium-sized enterprises in the context of creating their entrepreneurial orientation, and on the other hand, conducting the author's own research among small companies. Quantitative research was carried out from December 2017 to January 2018 among 400 small enterprises in Poland by means of a survey questionnaire using the CATI technique.

Key words: SMEs, IT tools, Internet technologies, SME management, business models, entrepreneurial orientation

INTRODUCTION

The continuous development of Internet technologies and tools has a significant impact on the functioning of small and medium-sized enterprises, and the constant progress of the functionality of the Internet offers many possibilities and opportunities that can be exploited in virtually all spheres of enterprises' business activity. As a result, the Internet has become a source of competitive advantages for entities that have access to it and are able to use its potential. The most popular and at the same time the most frequently used form of small and medium-sized enterprises' presence on the Internet is a website which is mainly used to inform the market about the existence of the company, to com-

municate with customers, to promote the company and its products as well as to build the company's image. Much less often, as research shows [Baller et al. 2016], Polish enterprises take advantage of the opportunities offered by the Internet, especially in the field of establishing and maintaining relationships with other enterprises and creating new organisational models of business operations. In these two areas of Internet use, Poland ranks 41st among 139 countries surveyed. In the EU, however, there are economies with even a lower ranking, such as Hungary, Italy or Greece. SMEs that actively use Internet tools tend to increase their revenues, employment, scope of market activity and export level more quickly [PARP 2018]. Digitisation allows for improving the productivity of SMEs

Renata Lisowska  <http://orcid.org/0000-0001-7591-2117>

 renata.lisowska@uni.lodz.pl

by optimising processes, expanding the market, introducing innovative products and implementing a more efficient use of human capital [McKinsey&Company 2016], which is important for these entities from the point of view of building a competitive advantage based on strong entrepreneurial orientation.

The aim of the paper is to analyse and evaluate the impact of the use of IT tools in various areas of SMEs' operations on creating their entrepreneurial orientation. Therefore, the following research hypothesis has been put forward: "Strong entrepreneurial orientation of small and medium-sized enterprises is positively influenced by the use of IT tools in various areas of their operations".

The implementation of such a goal and the verification of the hypothesis required a literature review and an analysis of current research on the IT tools used by small and medium-sized enterprises in the context of creating their entrepreneurial orientation which are included in the first part of the paper. The second part of the paper presents an analysis of the author's own research carried out among 400 small companies in Poland.

LITERATURE REVIEW

Managing a small and medium-sized enterprise operating in a changing environment requires increasingly often the implementation of appropriate solutions in the area of information technologies that allow, among others, to optimise and automate processes, support the decision-making process, support cooperation with suppliers and provide value to the customer. As it has already been mentioned in this paper, these entities usually use a website to exist in a virtual space. As indicated by the Central Statistical Office [GUS 2017], more and more small and medium-sized enterprises recognise the need to have their own website. In 2017, 62.6% of small and 85.3% of medium-sized enterprises had such a website. The reason for the creation of the Internet site was the need for the company to communicate with the environment through the presentation of catalogues of products and services (almost 63% of responses). Next in the ranking of reasons for having a website, the entrepreneurs indicated the presentation of information on vacancies, with the possibility of sending application documents (18.6% of responses), online

ordering or reservation (13.1% of responses), as well as ordering products and services according to one's own specifications (11.6% of responses) [GUS 2017].

The activities of small and medium-sized enterprises on the Internet were not limited only to the creation of a website, but also encompassed the use of cloud computing services, which was declared by 17.2% of medium-sized and 7.6% of small enterprises in 2017 [GUS 2017]. Enterprises using cloud computing solutions expected a number of benefits, most often including: better communication with the environment, quick access to knowledge, shortening the time to product launch, development of new business models and greater flexibility of offered products and services. However, for the significant majority of SMEs, the obstacles to using cloud computing solutions include, among others: limited trust in new technologies, concerns about data and service security, implementation costs, difficulties with integration of solutions and an unknown impact on company management.

Small and medium-sized enterprises use social media such as Facebook, Instagram, Twitter, LinkedIn, or GoldenLine, which is declared by 24.2% of small and 38.4% of medium-sized enterprises, more often than cloud computing solutions. The essence of these websites in the context of business management consists mainly in the personalisation of purchasing processes, communication with customers and building the company's image [GUS 2017].

Small and medium-sized enterprises that have appeared on the Internet most often use the following business models [Afuah and Tucci 2003, Akhtar et al. 2014]:

- brokerage model – companies act as organisers of virtual markets where buy and sell transactions are made;
- advertising model – companies, thanks to increasing the attractiveness of their websites, increase revenues from ads placed there;
- infomediary model – companies collect, process and pay for information about customers and offers from different manufacturers;
- merchant model – companies sell their products or services on the Internet;
- manufacturer (direct) model – companies, using the Internet, aim at direct contact with customers;

- subscription model – periodic access to Internet services is provided in return for payment of an appropriate fee.

The use of IT tools in SMEs can contribute to building a competitive advantage by using their own entrepreneurial potential which is often measured by the intensity of entrepreneurial orientation.

Entrepreneurial orientation is defined as a coherent set of interconnected activities and processes [Davidson et al. 2002, Dyduch 2008], structures, methods, practices, and behavioural styles [Lumpkin and Dess 1996, Bratnicki 2010, Rauch et al. 2017] that business managers use to act in an entrepreneurial way. This definition is based on the observation that enterprising companies are prone to take a greater risk than companies that lack entrepreneurial orientation, particularly under the conditions of uncertainty, proactively search for business opportunities and focus on introducing changes of an innovative nature [Kuratko and Hodgetts 2007, Covin and Miller 2014, Wach 2017].

The main dimensions of entrepreneurial orientation according to Miller and Freisen [1982] include: proactiveness, innovativeness and risk taking. Proactiveness is a trait characteristic of enterprises which constantly seek new opportunities and possibilities to respond to changing requirements and needs of their customers and enterprises which often become pioneers introducing new products or services. Proactiveness is seen as a desirable and even vital organisational trait, since proactive enterprises are oriented towards customers' future needs, actively searching for new solutions and opportunities [Aragon-Sanchez and Sanchez-Marin 2005, Deepa Babu and Manalel 2016].

Another dimension, innovativeness, is manifested in a given company's propensity for focusing on the creative process and new ideas supported by new technologies, which results in creating new products and services as well as streamlining processes within the company. In order to gain a competitive advantage, innovative enterprises concentrate on the R&D sphere, development of creativity and experimentation to generate new

solutions [Dyduch 2008, Bratnicki 2010, Nogalski and Karpacz 2011, Deepa Babu and Manalel 2016].

In the framework of this approach, the dimension of risk taking reflects the readiness of a given company to undertake audacious actions, e.g.: entering unknown, new markets or allocating significant resources to uncertain, high-risk projects which are associated with the probability of failure [Rauch et al. 2017].

The development of the concept of entrepreneurial orientation was proposed by Lumpkin and Dess [1996], who added two more dimensions: autonomy and competitive aggressiveness. Autonomy is a reflection of actions taken independently of the organisational boundaries and consists in company participants making freely and constantly decisions regardless of existing barriers, such as limited availability of resources or intensive competition [Deepa Babu and Manalel 2016]. This dimension is considered to be more of an antecedence to entrepreneurial orientation than its actual dimension, which is why it is not included in the interpretation of research results. Competitive aggressiveness is a given company's willingness to achieve a high market position and its desire to outcompete its market rivals, i.e. its propensity for intensifying direct challenges to competitors in order to gain a market share. The enterprise focuses on its own development in the existing market aiming to increase its market presence [Dyduch 2008, Bratnicki 2010, Nogalski and Karpacz 2011, Deepa Babu and Manalel 2016], which requires the company to be ready to use unconventional competition methods [Nogalski and Karpacz 2011]. The application of IT tools supporting the activities of small and medium-sized enterprises in various areas of their operations can be such methods.

RESEARCH METHODS AND CHARACTERISTICS OF THE ENTERPRISES SURVEYED

The adopted research hypothesis was verified on the basis of the analysis of the results of the primary study¹ which was conducted in the period from

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November 2017 to January 2018 with the use of the CATI and CAWI techniques among 400 small innovative² enterprises.

In the first stage of the study, 20,000 small enterprises (employing 10–49 persons) were drawn, out of which 8,000 companies were selected on the basis of a screening question. The realised sample size, i.e. the number of received, completed questionnaires, was 400. The conducted quantitative research, on the one hand, made it possible to reach more business entities and ensure the degree of anonymity of the respondents (it was often a prerequisite for conducting the survey). On the other hand, there was a high degree of difficulty associated with completing the survey, e.g.: partially filled questionnaires and problems with the interpretation of some questions.

The surveyed small enterprises were mainly service enterprises – 45.7%, manufacturing enterprises – 39.3%, and less often commercial enterprises – 15.0%. The spatial market structure of the surveyed enterprises was dominated by the domestic market – 40.8%, followed by the regional market – 31.4%, and the international market with the smallest share of 27.8%.

In addition, the obtained results indicate strong entrepreneurial orientation of the surveyed companies in all the analysed dimensions, i.e. proactiveness, innovativeness, risk taking and competitive aggressiveness³.

In the case of proactiveness, i.e. an attitude consisting in searching for market opportunities, the average rating was 3.91 points, which may indicate a high activity of the surveyed enterprises in the field of seeking market opportunities. More than 70% of the respondents rated this dimension at the level of 4 and 5 points. Another dimension, innovativeness, i.e. an attitude towards introducing new products, was rated at the level of 4 and 5 points by nearly 75% of the respondents, and the average rating was 4.03 points. However, in the case of the risk-taking dimension, i.e. risk-orientation, the readiness to accept risk, the average ranking was 3.41, and only 47.7% of the respondents rated this dimension at the level of 4 and 5 points. The last analysed area was competitive aggressiveness, i.e. an attitude towards market competition, which was ranked by almost 60% of the respondents at the level of 4 and 5 points, and the average rating was 3.63.

RESULTS

One of the research areas was the analysis of the use of IT tools in the surveyed companies (Table 1) which shows that these tools are most often used to promote the company, e.g.: online advertising through the company's website, advertising on other websites, search engine positioning, advertising on social media, and

Table 1. Areas of operations of the surveyed companies in which IT tools are used (%)

Areas of operations	Yes	No
Sales	57.0	43.0
Purchases	70.0	30.0
Company management support	71.8	28.2
Market information collection	77.3	22.7
Company promotion and communication with customers	80.3	19.7

N = 400.

Source: The author's own compilation.

² An innovative enterprise is an enterprise which in the last three years has introduced changes in its products, services, production or organisational methods. These changes may include (i) the introduction of new or improved products or services offered by a given enterprise; (ii) the introduction of new or improved production methods or methods of service provision in a given enterprise; (iii) the introduction of new or improved organisational methods.

³ The respondents rated on a scale from 1 to 5 the occurrence of a given area of entrepreneurial orientation in their enterprise.

to communicate with customers, e.g. through social media (80.3% of responses). IT tools are also often used to collect market information, e.g.: searching for customer data, their preferences, opinions, decision making criteria, competition (77.3% of responses), and less frequently in the sales area (57% of responses). The reasons for this state of affairs can be seen in a small share of sales of the surveyed enterprises through online shops (their own or run jointly by a group of entrepreneurs) (15.5% of responses), universal Internet platforms, e.g.: Allegro, eBay, OLX (13.8% of responses), and specialised Internet platforms (dedicated to a selected group of products/services, e.g.: OTOMOTO, ART-MADAM (16.8% of responses).

In order to verify the research hypothesis adopted in the paper, an assessment was made of the impact of the use of IT tools by the company in various areas of its operations on its entrepreneurial orientation. To achieve this goal, it was examined whether the use of IT tools in the following areas of operations: sales, purchases, company management support, market information collection, company promotion and communication with customers influences entrepreneurial orientation (analysed in four dimensions: proactiveness, innovativeness, risk taking and competitive aggressiveness).

In the case of the first dependence assessment, the analysis procedure began with verifying whether the obtained research results met the chi-square test assumption, i.e. whether all the expected counts were

greater than or equal to 5, and then the test was used to assess whether there existed a statistically significant relationship between the analysed variables i.e. the use of Internet tools in various areas of the enterprise's operations and its entrepreneurial orientation.

The analysis of the first dependence, i.e. the impact of the Internet tools used in various areas of the company's operations on its proactiveness started with the verification of the hypotheses:

- H_0 : the variables analyse dare independent against alternative hypothesis;
- H_1 : the variables analyse dare not independent.

The calculations carried out indicate (Table 2) that in the case of the three analysed areas of the company's operations (i.e. sales, market information collection as well as promotion of the company and communication with customers), from the point of view of the use of Internet tools, H_0 should be rejected for H_1 , as probability in the chi-square test is smaller than the assumed level of significance $\alpha = 0.1$, and thus the dependencies are statistically significant, i.e. there is a dependence between the Internet tools used in these areas of the company's operations and its proactiveness. In order to check the strength of this dependence, the contingency coefficient (C) was calculated, which indicated the existence of a weak relationship between the analysed variables.

However, in the case of other analysed areas of the company's operations, i.e. purchases and company management support, from the point of view of the use

Table 2. Statistical calculations for the chi-square test and the contingency coefficient (C) for the analysed dependence between the use of Internet tools in various areas of the company's operations and proactiveness

Areas of operations	Chi-square statistic	Chi-square <i>p</i> -value	Contingency coefficient (C)
Sales	15.961	0.006	0.205
Purchases	5.284	0.259	–
Company management support	2.861	0.587	–
Market information collection	12.069	0.017	0.171
Company promotion and communication with customers	14.128	0.007	0.185

N = 400.

Source: The author's own compilation.

of Internet tools, H_0 should be adopted, which indicates a lack of dependence between the Internet tools used in these areas of the company's operations and its proactiveness.

The analysis of the second dependence, i.e. the impact of the Internet tools used in various areas of the company's operations on its innovativeness, started with the verification of the hypotheses:

- H_0 : the variables analyse dare independent against alternative hypothesis;
- H_1 : the variables analyse dare not independent.

The calculations carried out indicate (Table 3) that in the case of the three analysed areas of the company's operations (i.e. purchases, company management support as well as promotion of the company and communication with customers), from the point of view of the use of Internet tools, H_0 should be rejected for H_1 , as probability in the chi-square test is smaller than the assumed level of significance $\alpha = 0.1$, and thus the dependencies are statistically significant, i.e. there is a dependence between the Internet tools used in these areas of the company's operations and its innovativeness. In order to check the strength of this dependence, the contingency coefficient (C) was calculated, which indicated the existence of a weak relationship between the analysed variables.

However, in the case of other analysed areas of the company's operations (i.e. sales and market information collection), from the point of view of the use of

Internet tools, H_0 should be adopted, which indicates a lack of dependence between the Internet tools used in these areas of the company's operations and its innovativeness.

In the case of the analysis of the third dependence, i.e. the impact of Internet tools used in various areas of the company's operations on risk taking, it began with the verification of the hypotheses:

- H_0 : the variables analyse dare independent against alternative hypothesis;
- H_1 : the variables analyse dare not independent.

The calculations carried out indicate (Table 4) that in the case of two analysed areas of the company's operations (i.e. company management support and market information collection), from the point of view of the use of Internet tools, H_0 should be rejected for H_1 , as probability in the chi-square test is smaller than the assumed level of significance $\alpha = 0.1$, and thus the dependencies are statistically significant, i.e. there is a dependence between the Internet tools used in these areas of the company's operations and risk taking. In order to check the strength of this dependence, the contingency coefficient (C) was calculated, which indicated the existence of a weak relationship between the analysed variables.

However, in the case of other analysed areas of the company's operations (i.e. sales, purchases, promotion of the company and communication with customers), from the point of view of the use of Internet tools, H_0

Table 3. Statistical calculations for the chi-square test and the contingency ratio (C) for the analysed dependence between the use of Internet tools in various areas of the company's operations and innovativeness

Areas of operations	Chi-square statistic	Chi-square <i>p</i> -value	Contingency coefficient (C)
Sales	5.821	0.213	–
Purchases	8.911	0.063	0.148
Company management support	18.492	0.005	0.293
Market information collection	4.140	0.387	–
Company promotion and communication with customers	7.910	0.095	0.139

$N = 400$.

Source: The author's own compilation.

Table 4. Statistical calculations for the chi-square test and the contingency ratio (C) for the analysed relationship between the use of Internet tools in various areas of the company's operations and risk-taking

Areas of operations	Chi-square statistic	Chi-square <i>p</i> -value	Contingency coefficient (C)
Sales	2.375	0.667	–
Purchases	1.676	0.979	–
Company management support	14.639	0.009	0.274
Market information collection	12.782	0.011	0.238
Company promotion and communication with customers	0.788	0.940	–

N = 400.

Source: The author's own compilation.

should be adopted, which indicates a lack of dependence between the Internet tools used in these areas of the company's operations and risk taking.

The analysis of the last, fourth dependence, i.e. the impact of the Internet tools used in various areas of the company's operations on competitive aggressiveness began with the verification of the hypotheses:

- H_0 : the variables analyse dare independent against alternative hypothesis;
- H_1 : the variables analyse dare not independent.

The calculations carried out indicates (Table 5) that in the case of three analysed areas of the company's operations (i.e. sales, market information collection as

well as company promotion and communication with customers), from the point of view of the use of Internet tools, H_0 should be rejected for H_1 , as probability in the chi-square test is smaller than the assumed level of significance $\alpha = 0.1$, and thus the dependencies are statistically significant, i.e. there is a dependence between the Internet tools used in these areas of the company's operations and its competitive aggressiveness. In order to check the strength of this dependence, the contingency coefficient (C) was calculated, which indicated the existence of a weak relationship between the analysed variables.

However, in the case of other analysed areas of the

Table 5. Statistical calculations for the chi-square test and the contingency ratio (C) for the analysed relationship between the use of Internet tools in various areas of the company's operations and competitive aggressiveness

Areas of operations	Chi-square statistic	Chi-square <i>p</i> -value	Contingency coefficient (C)
Sales	13.041	0.008	0.245
Purchases	0.796	0.939	–
Company management support	2.470	0.650	–
Market information collection	13.773	0.008	0.262
Company promotion and communication with customers	11.149	0.012	0.213

N = 400.

Source: The author's own compilation.

company's operations (i.e. purchases and company management support), from the point of view of the use of Internet tools, H_0 should be adopted, which indicates a lack of dependence between the Internet tools used in these areas of the company's operations and its competitive aggressiveness.

CONCLUSIONS

Based on the analysis of the literature and the conducted research, it can be concluded that small enterprises are increasingly often using more or less advanced IT solutions in various areas of their operations. These entities recognise the benefits of using modern IT tools, treating them as processes that support business management. Small enterprises mostly use their own websites as a communication tool with the environment in order to inform the market about the existence of the company as well as to promote products/services and build the company's image.

The research results presented in this paper allow for a positive verification of the research hypothesis concerning the positive impact of IT tools used by small enterprises on their strong entrepreneurial orientation. This is evidenced by positively verified dependencies indicating that the IT tools used in the following areas of the company's operations: sales, purchases, company management support, market information collection, company promotion and communication with customers influence its entrepreneurial orientation (analysed in four dimensions: proactiveness, innovativeness, risk taking and competitive aggressiveness).

A wide range of possibilities to use IT tools introduces a new quality and opportunities for managing small enterprises in the context of creating the entrepreneurial orientation essential for building a sustainable competitive advantage.

The value of this paper is manifested through the exploration and analysis of the research problem in a selected population of small enterprises in Poland. The study contributes to the increase of knowledge regarding the use of Internet tools in various areas of management of small and medium-sized enterprises and their impact on entrepreneurial orientation. Indicating the main limitations of the research, it is necessary to

emphasise above all a lack of full representativeness (testing only innovative companies), which encourages the author to design a broader study on this subject in the future.

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ZASTOSOWANIE NARZĘDZI INFORMATYCZNYCH W ZARZĄDZANIU MAŁYM I ŚREDNIM PRZEDSIĘBIORSTWEM W KONTEKŚCIE KREOWANIA ORIENTACJI PRZEDSIĘBIORCZEJ

STRESZCZENIE

W dobie rosnącej konkurencji globalnej obecność małych i średnich przedsiębiorstw w Internecie stała się koniecznością. Podmioty te zaczęły dostrzegać korzyści, jakie mogą uzyskać, stosując nowoczesne narzędzia informatyczne w różnych obszarach swojej działalności.

Celem artykułu jest analiza i ocena wpływu zastosowania narzędzi informatycznych w różnych obszarach działalności MŚP na kreowanie orientacji przedsiębiorczej. Realizacja tak postawionego celu i weryfikacja hipotezy wymagała z jednej strony przeglądu literatury przedmiotu i dotychczasowych badań dotyczących stosowanych przez małe i średnie przedsiębiorstwa narzędzi informatycznych w kontekście kreowania orientacji przedsiębiorczej, z drugiej zaś przeprowadzenia badań własnych wśród małych firm. Badania ilościowe przeprowadzono za pomocą kwestionariusza ankiety w okresie od grudnia 2017 do stycznia 2018 roku techniką CATI wśród 400 małych przedsiębiorstw w Polsce.

Słowa kluczowe: MŚP, narzędzia informatyczne, narzędzia internetowe, zarządzanie MSP, modele biznesowe, orientacja przedsiębiorcza

DETERMINANTS OF THE DEVELOPMENT OF VINEYARDS AND WINE TOURISM IN POLAND

Anna Mazurkiewicz-Pizło¹  , Wojciech Pizło² 

¹ Józef Piłsudski University of Physical Education in Warsaw

² Warsaw University of Life Sciences – SGGW

ABSTRACT

From the beginning of the 21st century, interest in vineyards and the production of wine from own grapes has increased in Poland, both from the demand and supply side. For many vineyard owners, this is a hobby that is unrelated to the professional work. The aim of this study is to identify the most important determinants that are beneficial to the development of wine-making and wine tourism in Poland. The analysis of secondary sources was used, including data collected by the Polish Agricultural Market Agency (since 2018 *National Support Centre for Agriculture*), the International Organization of Vine and Wine (OiV) and the Institute for Market Research GfK Polonia. It was found that the most important factors favouring the development of vines and vineyards in Poland are: global warming; production of more resistant vine strains; increased experience and skills of vineyard owners in the area of viticulture and wine production; activities of non-profit organizations related to vineyards; inclusion of Poland into the EU zone as a country with wine potential; legislative changes; promotion of Polish viticulture; increased wine consumption and the search for innovative and profitable forms of agriculture in rural areas.

Key words: wine, business, rural areas, tourism

INTRODUCTION

The development of winemaking and wine tourism can be approached in two ways: firstly, as an opportunity to stimulate the development of rural areas that have good conditions for grapevine farming; and secondly, as a new direction for the development of wine tourism, which is an original and fashionable form of leisure activity. In fact, these two approaches complement each other, since wine tourism cannot exist without wineries and wine-making; whereas wine-making without tourism generates a lower income, as is demonstrated by the experiences of countries that are traditionally associated with wine. It is worth noting that

this tourism activity was embraced by winery owners as part of their search for new channels of distribution for the wine they had produced. At the same time, it has generated other benefits, such as the possibility to create databases, conduct consumer research, become familiar with the consumers, build loyalty among visitors to the wineries and strengthen a brand.

Thanks to the attractiveness of this segment of the market, many persons now view vineyards and the production of wine as a potential source of income, and have decided to engage in these activities. However, the development of small wineries is important not only because of the income that the individual winery owners may achieve, but also because of the potential

benefits for a given region that stem from increased tourist traffic and the growth of tourism-related services. This creates what is referred to as economic multipliers; while social, cultural and environmental changes can occur as well. Furthermore, the development of wine tourism plays a significant role in the building of a regional brand, which allows the region to be identified in a larger sense. Local vineyards may therefore promote a region and its features, such as the local cuisine, traditions or cultural heritage. The establishment of wineries in Poland is part of the notion of multifunctional growth, which is meant to spur the development of rural areas and takes place thanks to the broadly-defined entrepreneurship of the people living in those areas. However, such Polish entrepreneurship differs considerably between individual municipalities. Frequently, the same community is comprised of entrepreneurial persons alongside many more persons who are helpless, have no vision for their future and respond passively to new developments [Kłodziński 1997]. Vineyards and winemaking may constitute an innovative direction for the development of activities in rural areas, which will not only lead to an increase in earnings and employment¹, but will also stimulate entrepreneurship and create models for those persons who are less willing to take on new forms of activity.

The interest in vineyards and wine-making has grown in Poland in the last decade, in terms of both the supply and demand. The Polish Agricultural Market Agency reports that 230 wineries were registered during the wine-making year 2018/2019, compared to 25 in the first year after the law requiring wineries to be registered was introduced. The aim of this study is to identify the most important determinants that are beneficial to the development of wine-making and wine tourism in Poland. The hypothesis of this work is following: The expansion of vineyards in Poland are determined by many factors. The most favourable factors seem to be: global warming; the production of new grapevine strains; growth of experience and skills winery owners and their activities, often in the form of NGOs; Poland's inclusion in the EU Zone A as a country with wine-making potential; legislative

changes; the active promotion of Polish wine-making; fashion; increasing consumption of wine in Poland; and the search for innovative and lucrative forms of activities in rural areas.

MATERIAL AND METHODS

Secondary sources were analysed; in particular, the legal acts concerning the production and sales of wine, and data collected by the Polish Agriculture Market Agency (ARR, since 2018 *National Support Centre for Agriculture* KOWR) concerning wineries that are registered in the agency and sell their own wine. The subject literature was also reviewed.

RESULTS

Wine-making in Poland

Even as late as in the 20th century, vineyards and the production and commercial selling of wine were rarely seen. It was only in the first decade of the 21st century that changes in the popular approach to wine-making began to appear, while legislative changes allowed citizens to establish wineries and formally recognised their activities. Since the economic year 2008/2009, the Polish Agriculture Market Agency has been obliged to collect statistics related to the sales of wine produced in private wineries. Twenty-five wineries were registered with the Polish Agriculture Market Agency in the first year; however, shortly thereafter the difficulties and inconveniences related to private wine-making caused the number of wineries registered with the Polish Agriculture Market Agency to drop. A breakthrough took place after the introduction of beneficial conditions for the production and selling of wine, which will be described further on in this study. As a result, the number of wineries in Poland began increasing every year, reaching 230 in the economic year 2018/2019. The number of wineries differs between regions, and depends on the local climatic conditions, soil quality and social conditions. The data collected by the Polish Agriculture Market Agency in 2018/19 indicates that the largest number of wineries is located

¹ Studies estimate that the establishment of a single agritourism site in a rural area generates employment for about 10 persons [Knecht 2009].

in the Małopolska Region (43), Lubuskie Voivodeship (34) and Podkarpackie Voivodeship (33).

The surface area of Polish wineries began to increase slowly as well, although it is still small in comparison to other countries (as the fact that it is not included in the European statistics indicates). According to Eurostat, there are no wineries in Poland. However, the Polish data indicates a considerable change: over nine years, the surface area of the vineyards has increased by eight times. In the economic year 2018/2019 it was 396.4 ha. A systematic increase in the surface area has taken place in the Lubuskie Voivodeship and Wielkopolskie Voivodeship.

The data indicates that Polish vineyards are expanding systematically. However, this expansion only concerns the wineries that are producing wine commercially. The surface area of vineyards is possibly higher – but due to the small size of some wineries and the relatively small amount of wine they produce, many owners have not registered with the Polish Agriculture Market Agency (ARR, since 2018 *National Support Centre for Agriculture* – KOWR).

Factors affecting the development of vineyards in Poland

The first factor influencing on the vineyards development is global warming. The year 2010 was yet another year in which the global temperature was higher than the average from the 20th century; it also marked the end of the warmest global decade in the history of the direct observation of temperature. Research shows that the global temperature has been increasing for the past 40 years, albeit with spatial and temporal irregularities. Every decade since the 1960s has been consistently warmer than the preceding one. However, the observed upward trend shows a high natural variability, which means that the average temperature in any given year or month may be much higher than the general trend. Temperature does not increase evenly; nonetheless, the average rate of warming in the last 25 years is a few times greater than that over the last 100 years [Kundzewicz 2012]. The climate warming that has been observed in Poland in recent years seems to affect every season. However, researchers believe that the temperature will increase the most in winter. On the other hand, the most significant deviations

from the current trend also occur in this season: some winters are very mild, while others (albeit relatively less often) are very cold; for instance, in the winters of 2005/2006, 2009/2010 and 2010/2011 [Kundzewicz 2012]. The climate warming in Central and Eastern Europe, including in Poland, creates the opportunity for farming thermophilic plants, although the recurring freezing temperatures in the winter and the ground frost in spring can still endanger such plants. Furthermore, climate warming entails many harmful phenomena, including the increasing occurrence of heatwaves, intense rainfalls, droughts during the growing season or strong winds that cause significant damage in rural areas [Kundzewicz and Kozyra 2011].

Despite the beneficial upward trend in the temperature, the conditions for grapevine farming in Poland remain much more difficult than in traditional wine-making regions. The climatic conditions and soil composition yield grapes that have a lower sugar content (usually 17–23%) and, consequently, a lower alcohol content, with high acidity and a high polyphenol content. On the other hand, the advantage of these conditions is a better balance between the sugar content, acid content and pH, as well as a better accumulation of certain aromatic compounds, which allows for the production of very high-quality table wine. The high acidity can also provide a feeling of freshness, especially in the case of white wine [Izajasz-Parchańska et al. 2012].

Another factor having an impact on the development of wine-making in Poland is production of grapevine strains that are more resilient against cold. Extensive experience from recent years shows that grapevines can be farmed in the colder regions of Europe. However, to achieve a high-quality wine, the strains of these grapevines have to be chosen appropriately to match the environmental conditions. Therefore, Polish wineries benefit the most from the introduction of new strains, especially those referred to as complex hybrids (crossbreeds of European and American grapevines). Compared to common grapevines, these complex hybrids are more resistant to freezing temperatures, and require less warmth during the growth period [Rusnak 2012] while providing a better yield and more resistance to diseases. Experiments show that complex hybrids are well-suited for integrated tilling and ecological (organic) farming [Myśliwiec 2013].

A majority of the most popular strains of grapevine in Poland are complex hybrids, which are much more resistant to weather changes and the difficult Polish climate. At the same time, they provide grapes and wine with a good consumptive value. Complex hybrids are also now used in countries with long-standing wine-making traditions, such as the Regent variety in Germany or the Bianca in Hungary. Polish wine-makers are also attempting to grow strains of the common grapevines, such as Riesling, Sylwaner, Weltliner and Traminer. However, these strains are more vulnerable to diseases and to cold and usually provide a lower yield. Moreover, the potential quality of the wine obtained from the common grapevine in a colder climate is debatable due to the shortened growth period, less sunlight during the fruit maturation period, and the heavy clay soils which are present, for instance, in the Podkarpackie Voivodeship. It seems that the warmer areas of Poland are the most suitable for the common grapevines, such as in the Lubuskie Voivodeship. However, the fact that Polish wine-making will likely benefit the most from complex hybrids, such as Regent, Rondo, Hiberna or Jutrzenka, has been confirmed by the medals that the manufacturers of these wines have won in international competitions (Vinoforum and Enoexpo) [Myśliwiec 2013, Golis 2014].

Growth of experience and skills of winery owners is another development factor of vineyards areas in Poland. With the growing popularity of wineries, more and more people are becoming interested in growing their own grapevines. However, the lack of a wine-making tradition in Poland means that knowledge on this subject is not passed down from generation to generation, unlike in the practice of pomiculture. Consequently, those persons who decide to start private wineries have to make the effort to learn on their own, often through trial and error and by looking up information on various on-line forums and specialist publications for wine-makers. Courses and programmes organised by wine-making associations and institutions that support the wine-making activities in Poland have also contributed significantly to an improvement in the relevant knowledge and skills. Such courses are conducted on a regular basis by the Podkarpackie Wine-Maker Association and the Zielona Góra Wine-Making Association. Apart from the traditional forms of

teaching (lectures given by experts on the subject), the wine-making associations organise field trips to wineries in which the participants can learn how to correctly plant, grow, trim and care for the grapevines directly, as well as trips to foreign wineries that allow Polish wine-makers to observe their more experienced colleagues, ask questions and take part in practical classes.

The legal regulations also contributed to the changes in Polish wine-making. Poland is among the EU member states whose law permits selling wine produced in the country's domestic wineries, as per the Council Regulation (EC) 2165/2005 amending Regulation (EC) 1493/1999 on the common organisation of the market in wine, as of 1 August 2006. According to the regulation, Poland now belongs to the wine-making Zone A, which is one of three such zones within the EU that were established according to such factors as the climatic conditions, surface area or type of soil. Each zone has a set of permitted wine-making practices. For instance, the wine-makers in Zone A are allowed to increase the natural volume of the alcohol content using particular methods, as long as the content does not exceed 3% Vol. (compared to the stricter limits of 2% Vol. and 1.5% Vol. in Zones B and C, respectively) [Skiba 2011].

Up until 2008, Polish private wine-makers had very limited possibilities to sell their products due to the legal entries that obliged them to maintain fiscal warehouses, which required appropriate machines, private laboratories and certificates from various institutions. All of these obligations formed unsurmountable barriers for the fairly small manufacturers of wine, due to the high amount of time and funds needed to fulfil them. In 2008, a change was introduced to the Excise Tax Act and the Act on the production, bottling and selling of wine products and the Organisation of the Wine Market. According to the new regulations, those wine-makers who produced grape wine in an amount no greater than 1,000 hl per year were exempt from the obligation to own fiscal warehouses. However, despite this beneficial change, the wine-makers still faced many significant problems such as the ambiguity of the regulations concerning the legal status of their businesses. A new Act on the production, bottling and selling of wine products and the Organisation of the Wine Market was only introduced as recently as 12 May 2011. The aim of this act was to improve the conditions for the development of

wine-making in Poland and to encourage the commercial production and selling of wine produced in private wineries. The act imposed a considerable number of obligations on the wine-makers, but also specified several opportunities in more detail. The most important of these changes were [Mazurkiewicz-Pizło 2013]:

- The possibility to produce wine from one's own grapes in an amount no greater than 1,000 hl without the need to register a winery as an economic activity. This means that those farmers who grow grapes and produce wine do not lose their right to insurance in the Farmers' Social Security Fund.
- The possibility to sell wine for retail purposes at the manufacturing site. This means that wine-makers do not need to have a dedicated building for wine selling, which previously had to comply with particular requirements and receive approval from the Sanitary and Epidemiological Inspectorate;
- A clear distinction between wine produced from grapes grown in private vineyards located in Poland and wine produced through the fermentation of grape juice, manufactured as part of the exemption that was given to Poland². Since 2012, wine cannot be labelled as Polish wine, if it is produced from imported grape juice. Such products are now termed wine made from grape juice.
- Regulations established concerning the registration of protected geographical symbols and the names of origin of Polish grape wines.
- Any wine that is labelled with the name of the grapevine strain from which it is produced and the year of production has to be certified according to the EU regulations.
- Most strains of *Vitis vinifera* are allowed for wine production, except those that are excluded from legal farming.
- Popular strains of grapevines that are not registered in other member states were legalised in Poland, such as Muszkat Odeski, Jutrzenka, Frontenac and La Crescent.

In the vineyards development the significant role play also non governmental organizations. Such wine-making associations, which are usually established by winery owners, allow for not only exchanges of knowledge and experience, but also the organisation of theoretical and field training, the stimulation of tourism-oriented actions, the organisation of wine-making events and the designing of wine-making routes [Mazurkiewicz-Pizło 2015]³. Each wine-making region of Poland also undertakes actions to encourage interest in the vineyards and wine tourism among tourists. These actions are undertaken not only by the winery owners (as the parties that directly benefit from them), but also by NGOs, some local and regional authorities (such as municipality of Janowiec or the town of Jasło) and businesses related to tourism. Actions aimed at stimulating the development of wine tourism in Poland include: organisation of wine-making competitions and annual wine-maker gatherings, wine-making events, such as wine days, grape harvests or festivals, establishment of wine-making routes (such as the Sandomierz Winery Route), encouragement of media interest in Polish wineries (public relations). The variety and broad scope of these actions has had a stimulating effect on the development of wine-making and wine tourism in Poland. These actions involve not only the broadcasting of information about the existence of the wineries, but the far-reaching education of both wine-makers and tourists. Furthermore, the actions are undertaken by a vast range of entities, such as individual winery owners, trade organisations or local and regional authorities (through the sponsorship of pamphlets, wine festivals, catalogues, etc.). As one example, the Lubusz Cluster of Wine and Mead has operated in the Lubuskie Voivodeship since 2006. The cluster was established by the Lubusz Wine-Makers' Association, and focuses on promotional actions and activities to encourage the establishment of wine-making traditions and the development of wine tourism in the region.

² Wine produced through the fermentation of grape juice does not fall under the EU's regulations on the common organisation of the market; in contrast to wine that is produced from grapes grown in private vineyards, which does fall under these regulations.

³ More information about the role of NGOs in the development of wine-making in Poland can be found in Mazurkiewicz-Pizło [2015].

Finally, it seems that an important factor of vineyards development in Poland is increasing the wine consumption in our country. The yearly consumption of wine in Poland, despite fluctuations over the years, showed an upward trend. In 1995 the Poles drank 300,000 hl of wine during the year. However, in 2014 there were 1,014,000 hl almost four times more [OiV 2018].

The yearly consumption of wine per person varied between countries. In some countries, such as Italy, France and Portugal, it exceeded 40 l per person; while other countries, such as the Czech Republic, Bulgaria, Lithuania and Slovakia, showed a much lower level of consumption. The consumption of wine in Poland was very low compared to other countries (Turkey and Latvia were the only countries with a lower yearly consumption of wine measured at 1 l per person). Furthermore, while the yearly consumption of wine in Poland has increased systematically, the increase is insignificant when compared to other countries. Since 2007, the average Pole has consumed 3l of wine per year, compared to about 2l before 2007 [OiV 2018]. Thus, a very slow increase has taken place, and it will likely persist due to the many factors that are stimulating wine-drinking, such as fashion, prestige and promotions on the part of winery owners, wine distributors and sellers, and also its role in the film industry. It can be observed that the characters in many recent films and television series drink wine in various situations; for instance, when they are feeling sad or happy, or when they are having a bad day.

The increase in the consumption of wine in Poland has also been confirmed by research conducted by the GFK Polonia market research institute. According to the institute, the grape wine market in Poland noted an increase in 2015, in terms of both the number of buyers and the amount of products bought. The analysed category encompassed the purchases of grape wine for consumption at home. In 2015, over half of all households (55.6%) bought wine at least once in the year. An increase of 0.7% was noted when compared to 2014, and the value of the purchased wine increased by 2.7%. On average, Poles bought wine five times per year. During a single visit to a store, the average Pole would buy 1.1 l of wine for an average price of PLN 18.20 (EUR 4.3); while 67% of the respondents repeated the purchase at least once within the following 12 months. Poles spent the most money (39% of all grape wine

purchases) in discount stores, followed by hypermarkets (24%) and supermarkets (17%). In 2015, Poles bought primarily red wine (which constituted 56% of the total volume of purchases), white wine (33%) and a small amount of rosé wine (11%). The largest increase of purchases compared to the preceding year was noted for white wines [GFK Polonia 2016].

SUMMARY

The above considerations clearly indicate that vineyards and wine tourism in Poland are developing consistently, thanks to the aforementioned determinants. The following actions should be taken to maintain this development:

- Education in grapevine farming should be supported by introducing formal education in this area: for instance, in vocational schools, gardening colleges or university courses.
- Non-governmental organisations should be supported in terms of developing wine-making courses, the promotion of grapevine farming and vitourism and the organisation of wine-making events.
- Legal procedures related to running a vineyard and producing and selling wine should be simplified as much as possible;
- Tax reliefs or grants should be given to the vineyard owners who conduct tourist activities, as they are promoting their respective regions and increasing local tourist traffic.

The emerging wine-making branch in Poland and its contribution to the country's development are admirable. Nonetheless, it is also worth pointing out that this new branch may also have negative effects, such as alcohol addiction. The intense promotion of wine sends messages to the public, such as the not necessarily scientifically-verified view that drinking wine can help to maintain or even improve health and well-being, which may be misunderstood by the society as encouragement to drink wine as a cure for various ailments of the body and soul.

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CZYNNIKI ODDZIAŁUJĄCE NA ROZWÓJ WINIARSTWA I ENOTURYSTYKI W POLSCE

STRESZCZENIE

Od początku XXI wieku w Polsce wzrosło zainteresowanie uprawą winorośli i produkcją wina z własnych winogron, zarówno producentów, jak i konsumentów. Dla wielu właścicieli winnic jest to hobby niezwiązane z ich pracą zawodową. Celem niniejszej publikacji jest identyfikacja czynników sprzyjających rozwojowi upraw winorośli w Polsce. Wykorzystano analizę źródeł wtórnych, w tym dane zebrane przez Polską Agencję Rynku Rolnego (ARR, od 2018 r. Krajowy Ośrodek Wsparcia Rolnictwa KOWR), Międzynarodową Organizację Winorośli i Wina (OIV) oraz Instytut Badania Rynku GfK Polonia. W wyniku analizy stwierdzono, że najważniejszymi czynnikami sprzyjającymi rozwojowi upraw winorośli i winnic w Polsce są: globalne ocieplenie; produkcja bardziej odpornych szczepów winorośli; wzrost doświadczenia i umiejętności właścicieli winnic w obszarze uprawy winorośli i produkcji wina; działalność organizacji non profit związanych z winnicami; włączenie Polski do strefy UE jako kraju o potencjale winiarskim; zmiany legislacyjne; promocja polskiego winiarstwa; zwiększenie konsumpcji wina w Polsce oraz poszukiwanie innowacyjnych i dochodowych form rolnictwa na obszarach wiejskich.

Słowa kluczowe: wino, business, obszary wiejskie, turystyka

CONVERGENCE PROGRAMMES AS AN ECONOMIC POLICY TOOL WITHIN THE EUROPEAN UNION

Marta Postuła¹, Jacek Tomkiewicz², Justyna Sobolewska¹  

¹University of Warsaw

²Kozminski University

ABSTRACT

The article presents the results of research indicating to what extent the convergence programmes submitted to the European Commission prove country's willingness to improve the fiscal policy in a desired way and to what extent they constitute a mere fulfilment of a formal duty without any actual intent to achieve the indicated macroeconomic parameters. The conducted analyses allow to conclude that the European countries, while preparing the prognostic documents, have a tendency to hide the scale of the fiscal imbalance that reflects a lack of consistency between the current balance of the sector and an increase in the public debt. The results of quantitative and qualitative research indicate that, regardless of the implemented regulatory solutions at the EU level in the framework of the modified Stability and Growth Pact, certain flaws of the tools used for economic policy coordination at the European level are still visible.

Key words: macroeconomic prognosis, convergence programme, coordination of the fiscal policy, European Union, Stability and Growth Pact

INTRODUCTION

The European Union is based on the rules of free movement of goods, services, capital and workforce, which considerably limits the possibilities of the national economic policy by the inapplicability of such instruments as duties, export subsidies or capital flows limits. The creation of a common currency area is the next significant limitation of possibilities of the national economic policy – decisions related to the shaping of the money supply, interest rates or the exchange rate have been transferred at the transnational level (the European Central Bank).

Therefore, the national macroeconomic policy of the EU Member State (in particular in relation to the members of the eurozone) has been limited to the fiscal policy. The latter is also subject to considerable restric-

tions. First of all, the macroeconomic parameters (the level of the debt and deficit of the public finances sector) in the framework of which the EU Member States can conduct their national budget policy have been determined. Regulations (the Stability and Growth Pact with further additions/amendments) in this field set out in detail the acceptable limits of the debt and deficit as well as procedures and potential sanctions for the countries that do not follow the rules. Taking care of the low debt level is important, as it has a negative impact on the long-run performance of eurozone member states. Therefore, the stability programmes and convergence programmes are tools that serve the disciplining of the EU Member States, so as to ensure that they conduct a responsible fiscal policy [Verdun and Zeitlin 2018].

The research problems presented in the article are focused on the analysis of the impact of the prepared

Justyna Sobolewska  <https://orcid.org/0000-0001-9861-485X>
 justyna.sobolewska@student.uw.edu.pl

convergence and stability programmes on the social and economic policy. The aim of the research presented in this study was to determine to what extent the parameters set out in the programmes constitute an actual willingness to improve the fiscal policy desired by a given country and to what extent they constitute a mere fulfilment of a formal duty without any actual intent to achieve the indicated macroeconomic parameters. The authors would like to examine whether, and if yes – to what extent – the prognoses presented by the governments of given countries in the framework of the convergence programmes or stability programmes updates have an actual impact on the public finances and therefore are an efficient tool for implementation of the EU economic policy.

Quantitative and qualitative methods will be used in order to verify empirically the hypothesis resulting from the above-presented research problem. The qualitative research was based on the overview of the present literature and applicable legal acts. The quantitative research includes a comparison of prognoses included in the convergence programmes with the actual state of macroeconomic parameters.

The text structure is as follows: in the first part, we discuss arguments for the need of coordination of the budget policy in the EU Member States, and we present the most important critical opinions relating to the applicable regulations. Therefore, parts of deliberations carried out in this article constitute a verification of the above-indicated theses through a comparison of the provisions in selected convergence programmes with the actual implementation of the macroeconomic variable data. The article is concluded with conclusions and recommendations for potential changes in regulations at the European level.

NECESSITY TO COORDINATE THE FINANCIAL POLICY – OVERVIEW OF THE ARGUMENTS

The financial crisis that started in 2008 and the economic downturn resulting there from have contributed to searching for new legal, economic and social solutions in order to achieve stability of the financial system and of the long-term economic development [Schick 2010, Lane 2012, Weber 2012, da Costa Cabral 2016]. The problems of the financial sector con-

tributed considerably to the reduction of stability in the public finances sector. An emerging need for the generation of additional financial resources intended, among others, for aid to the banking sector, and measures stimulating the maintenance of economic growth had a negative impact on the fiscal balance, hence the need for introduction or reinforcement of the existing fiscal governance framework at the national and transnational levels [Balassone and Franco 2003]. One of the most important regulatory requirements applicable in the public finances sector of the EU Member States are the principles resulting from the fiscal rules adopted at the EU-level and those applicable at the national level of the member states.

The coordination of the fiscal policy within the EU has theoretical, practical and political justification. It is particularly important in the case of the countries sharing the common European currency [Zeitlin and Vanhercke 2018].

First of all, functioning of the one European Central Bank (ECB) means a common monetary policy for all eurozone member states. The basic assumption of the common currency zone theory is a synchronisation of the business cycle, and the character of the national fiscal policy (expansive versus restrictive) may be a significant factor of differentiation of the economic growth pace [Marneffe et al. 2011]. Therefore, it is necessary to ensure convergence of the basic fiscal parameters that shall contribute to the reduction of differences in GDP dynamics and, at the same time, shall enable conducting monetary policy that will be optimal for the entire eurozone [Moyosova Kyoseva 2006, Wasserfallen 2014].

Next, even though the decisions concerning the money supply are taken at the central level (EBC), the member states can directly, through their expansive fiscal policy, contribute to the growth of money supply within the zone [Tanzi 2013, Hall 2014]. This happens because the Treasury securities of the member states serve to collateralise the Lombard credit that the commercial banks from the member states may take in the EBC. Conducting an expansive fiscal policy even in one member state may result in a necessary restrictive attitude of the EBC that will have a negative impact on the dynamics growth in the entire eurozone.

Third, foundation of the eurozone eliminated the exchange rate risk in the case of Treasury securities of the member states, which, ensuring freedom of capital movements, enables the use of foreign savings in financing the public debt. Conducting an expansive fiscal policy by a member state is a kind of “free rider problem”: It can have high deficit/public debt and low domestic savings at the same time. Meanwhile, a crowding-out effect occurs at the international level. The necessity of presenting the convergence programme should be a clear signal for the investors that the supply of Treasury securities of the countries with high deficits will be falling that will enforce a change of allocation of capitals within the eurozone [Belassone and Franco 2003].

And fourth, the Treaty does not provide for the possibility of “throwing some countries out” of the eurozone and the entire EU, and this practically means the impossibility to announce the insolvency by a member state. The insolvency would mean the necessity of leaving the EU with all consequences. Therefore, in a situation when the financial markets will refuse to finance the public debt, public financing from the other EU members or transnational institutions such as the IMF must be ensured. Clearly, it is in the interest of the taxpayers of all the EU countries to ensure the stability of public finances within the member states.

The last argument is a reminder that the convergence and stability programmes are not only commitments of the given countries to conduct the fiscal policy in a specific direction, but most of all, they are a source of reliable prognoses concerning the macroeconomic situation in the medium term. Therefore, the European Central Bank and other EU bodies, mainly the European Commission, have a set of macroeconomic data that are a basis for conducting the macroeconomic policy at the EU level.

It is also important to note that the provisions of the Stability and Growth Pact refer mainly to the structural balance, not the intraday balance (point balance) of the public finances, so the required adjustment should constitute structural changes in public finances, not a mechanical reduction of the fiscal imbalance that has pro-cyclical consequences [Resolution of the European Council 97/C 236/01]. The acceptable deficit level (3% of the GDP) and provision on possibility

of the deficit-increasing in the face of a severe recession provides a sufficient area for the automatic fiscal stabilisers to operate. Research for the years 1999–2006 indicated that the provisions of the Stability and Growth Pact did not constitute restrictions for conducting a countercyclical fiscal policy in the EU Member States [Marinheiro 2008].

There are also critical voices referring to the institutional set-up in the framework of which the EU and eurozone operate. First of all, the neoliberal assumptions that supposedly gave rise to the Stability and Growth Pact are pointed out [Stockhammer 2016]. Imposition of the necessity to conduct a restrictive fiscal policy enforces ensuring the economic dynamics by growing the private indebtedness or maintaining the export surplus. Impossibility to use financial instruments in the case of recession/downturn should give a possibility of fiscal expansion, but the EU rules enforce fiscal adjustment which deepens the regression and worsens the state of the public finances even more. In practice, the only solution is an “internal devaluation” (reduction of wages) and a “fiscal devaluation”, that is to say cutting the direct taxes and social security contributions at the expense of an increase of the role of indirect taxes that reduces the employment costs and increases the companies’ competitiveness [Cizkiewicz et al. 2017]. Such adjustments are possible and they actually occur within the eurozone, but they last for a long time and they entail very high social costs.

One also cannot forget that the eurozone member states that went through a severe economic crisis had not been conducting any irresponsible, expansive fiscal policy before. A high structural deficit and public debt actually occurred only in Greece. Ireland and Spain had budget surpluses while the imbalance in Italy resulted mainly from the cost of the servicing of the debt. Thus, the state of public finances does not prejudge the economy situation the instability of which may have its roots in the private sector, not in the public one.

Even before the outbreak of the financial crisis within the eurozone, it was being indicated [Mencinger 2003, Alves and Afonso 2007] that the acceptable fiscal deficit levels in the view of impossibility to use the monetary policy, are too low to efficiently absorb the asymmetric shocks, whereas the adjustment required

in the convergence programmes will have a strong pro-cyclical impact. At the same time, the Community budget is too small to be an efficient policy tool in terms of maintaining the economic dynamics [Kopits and Symanski 1998].

The course of the crisis in the eurozone largely confirmed these fears. The imposed fiscal adjustment in the countries that went through the debt crisis deepened the recession and hindered the financing of the public debt through a fast growth of the difference in market rate of the German Treasury securities and the those of the so-called peripheral countries [Moździerz 2015, Dallago 2016, Stiglitz 2016]. It is only after the decision of the EBC of 2012 (famous speech of the President Draghi: "...whatever it takes..." of July 2012) on massive purchase of Treasury securities of the eurozone governments on the secondary markets enabled to reassure the financial markets which is visible in the fall of the "spreads" [De Grauwe and Ji 2013]. By the way, such an action of the EBC, despite being undoubtedly effective, can hardly be considered as being in line with the "spirit" of the Treaty that prohibits financing of the public debt from the EBC resources.

To sum up, the necessity to prepare the Stability and Convergence Programmes by the EU Member States is undoubtedly an important tool of disciplining the fiscal policy in the EU countries. Despite controversies concerning the assumptions underlying the enforcement of stability in public finances, we should not have doubts that the programmes should be professional, reliable documents setting out the directions of policy of the given countries in the medium term.

MATERIAL AND METHODS

The research sample is constituted by selected European Union countries that were obliged to prepare updates of the convergence and stability programmes containing information on the fiscal policy enabling leaving the excessive deficit procedure. The period between 2007–2015 was adopted as the research period. The data within this period include all complete years of membership of these countries in the EU. To achieve the objectives of the research, database from European Commission about convergence programmes was

compared to macroeconomic data from the Eurostat. The sample and the period were chosen in a purposeful manner due to comparability of the qualitative and quantitative data.

The basic parameters subjected to the fiscal evaluation were still the deficit of the public finances sector and the public debt regardless of the introduced regulatory clarifications at the EU level. The balance of the public finances sector in relation to the GDP in the case of most countries, was a reason for launching the excessive deficit procedure. As of 1 January 2018, this procedure is imposed on 3 EU Member States: France, Spain and the Great Britain. In the case of France and Spain, the excessive deficit procedure was imposed in 2009, whereas the Great Britain received decision on launching the procedure in 2008. Within the European Union, there are two countries in relation to which the excessive deficit procedure has never been launched: Estonia and Sweden. In the case of the rest of the EU Member States, this procedure has been imposed and removed after implementing the corrective actions.

In the framework of conducted research activities, in the first place, we carried out an analysis of the arithmetic means of deviations of the prognosis set out in convergence programmes from its actual execution.

RESEARCH RESULTS

It should be noted in the first place that at the level of calculated mean deviations, the prognoses are relatively accurate that are visible in small discrepancies between the plans and execution of the public expenditures and revenues. This proves both the professionalism of the officers preparing the convergence programmes whose prognoses are quite accurate and the serious approach of the governments to implementation of commitments resulting from the EU regulations. Certain larger deviations are visible within the crisis period, but this was affected by external factors, difficult to foresee at the prognostic stage by the countries. However, deviations of the executed deficit from its planned level are visible. This has been occurring systematically and even to a much larger extent after 2008. This was affected by a tendency to undercut the expenditures level – almost every time within the

analysed period they were planned below the level at which they were actually executed. In the case of the public revenues, the research revealed that more often they were being planned in a too ambitious manner, meaning the governments fail to execute them at the planned level, but it happens less often and on a smaller scale than in the case of public expenditures.

While carrying out such an analysis, we should remember that these are values presented as per cent of the GDP, which explains the above-indicated correlation to a certain extent. The level of public revenues depends on the economic activity's scale (consumption and revenues of the business entities) that is taxed, so the GDP dynamics growth/fall translates automatically into the level of public revenues. Whereas the expenditures are largely set out on their nominal level, their volume is, to a large extent, independent from the current GDP. The possibility to reduce the expenditures in the face of lower incomes are limited – the majority of them is “legally determined”, for example referring to the social benefits.

Taking this into account, we carried out an analysis of the impact of the deviations in the GDP prognosis on the given variables describing the fiscal policy. The fundamental influence of the GDP dynamic deviation on the revenues level is not visible – even when the prognosis of the GDP dynamics is clearly inaccurate, the revenues are not fundamentally lower – see example: data from 2009 and 2012 in Table 1. It means that the income side of the automatic fiscal stabilisers is of limited significance – we do not see whether or not the public revenues change more than proportionally in relation to the changes in the GDP dynamics. Of course, we should remember again that it is a relation revenues/GDP, so in nominal terms, the public income is significantly lower than the one planned.

A clear difference between deviations in the debt and in the deficit is interesting. Discrepancies in terms of the public debt are much higher than in the case of the balance. This also shows a problem of a low transparency of the system: the public sector debt has been rising more than it results from the current imbalance.

Table 1. Comparison of the actual macroeconomic data in 2007–2015 and the prognosis from the year before ($n - 1$) in 19 EU countries under research; arithmetic means of deviations in % of GDP

Year	Real GDP ^a	Total revenue ^b (% GDP)	Total expenditure ^c (% GDP)	Net lending/borrowing ^d (% GDP)	Gross debt ^e (% GDP)
2007	1.4	-0.5	-1.5	1.0	-1.9
2008	-3.2	-0.9	1.1	-2.0	4.7
2009	-5.6	0.2	3.3	-3.6	10.3
2010	0.2	-0.7	4.3	-4.9	12.2
2011	-0.5	-0.3	-0.7	0.3	2.7
2012	-2.9	0.6	1.2	-0.6	4.5
2013	-1.3	0.4	1.6	-1.3	5.2
2014	0.8	0.6	1.0	-0.4	0.7
2015	1.4	0.1	0.2	-0.1	-2.9

^a Difference between the prognosis $n - 1$ and the implementation; “-” sign means a growth that is slower than the prognosis.

^b “-” sign means planned revenue higher than those executed.

^c “-” sign means expenditures that are higher than those executed.

^d “-” sign means the deficit that is higher than the one that was planned.

^e “-” sign means the lower debt than the prognosis.

Source: Own study based on data from Eurostat and European Commission.

Most likely, it results from the use of classification of transactions in such a way as not to reveal the current imbalance. It is possible through accounting the expenditures as debits, the use of differences in cash and accrual classification or through indebting the parts of the public sector other than the central budget, e.g. in order to avoid the amendment of the budget at the national level. Quality and transparency of the public finances system, as we can see, leaves much to be desired. The scale of complexity of the public systems and of ambiguities in the rules of macroeconomic statistics cause difficulties in analysis – the public debt level is not directly related to the current budget balance and vice versa. Such discrepancies hinder the assessment of the fiscal policy of a given government by the domestic entities (taxpayers, beneficiaries of the public goods) and by the foreign international organisations or purchasers of the Treasury securities. The comparative study [Weber 2012] confirms that the countries with the highest level of public finances transparency have the lowest discrepancies in data describing the state of public finances, that is the debt level results directly from the budget's balance. Therefore, we can see that the transparency of the State finances has a fundamental impact on the reliability of the research on the effects of the fiscal policy, because it guarantees the reliability of the basic data setting out the state of public finances.

Data presented in Table 1 suggests the need to deepen the analysis of years 2009 and 2010, when a very large increase of deficits in relation to the plans despite relatively good prognosis of the revenues and clear reduction of expenditures could be observed. The deviation between prognoses and actual execution of the debt level was then even greater than during the crisis. It is worth looking in detail into situation during these two years, comparing the actual state with the prognosis carried out one year and two years earlier. Table 2 presents the most important remarks resulting from analysis of the presented data.

Prognoses drawn up in 2008 for 2009 also indicate that the seriousness of the crisis was not noticed – once again, the prognoses are considerably different from their execution, albeit to a lesser degree than in the case of the plans implemented two years earlier. Most likely, it is due to the calendar – the bankruptcy

of the Lehmann Brothers Bank that is considered as the beginning of the crisis, took place in September 2008, whereas the convergence programmes are prepared for the spring.

The year 2010 indicates that the situation, at least in terms of accuracy of the planning, was put under control, even though we can notice some spectacular cases where the prognoses were far away from the reality (plans drawn up in 2009 for 2010):

- In Ireland, it was not stated in the plans submitted to the European Commission in 2009 that it would be necessary to seriously support the financial sector from the public funds – it is clearly visible in expenditures that were much higher than planned that entailed higher deficit and public debt levels.
- We can find a justification for creation of a “PIGS club” (Portugal, Italy, Greece, Spain) in media and among the financial market participants – in the case of those countries, we can see not only fast public debit growths, but most of all we can see that the debt dynamics is significantly higher than the governmental prognoses that might indicate that the governments were losing control over management of the public debt. The market responded on that with a fast increase of “spreads”, that is differences in profitability of the Treasury securities of Germany and of the other countries.
- The problem mentioned hereinabove has been deepening – we can see an inconsistency between the current fiscal imbalance and the increase in the public debt. For example: Austria had better balance than planned and at the same time, the public debt is considerably higher than the prognosis. We cannot explain it by a decrease in GDP dynamics, because the one in Austria was better than the prognoses. Such a discrepancy is clearly visible also in Greece, Portugal or in Lithuania.

DISCUSSION

The fulfilment of nominal convergence criteria resulting from provisions of the EU treaties does not constitute an ultimate objective of the conducted economic policy but is a rational method possible to apply in order to ensure a stable and sustainable economic development and healthy public finances in medium-

Table 2. Prognosis and of the basic macroeconomic values in 2009 and 2010 compared to prognoses presented a year ($n-1$) and two years ($n-2$) before

Country	Real GDP ^a			Total revenue ^b (% GDP)			Total expenditure (% GDP)			Net lending/borrowing ^c (% GDP)			Gross debt (% GDP)							
	2009	2010	2010	2009	2010	2010	2009	2010	2010	2009	2010	2010	2009	2010	2010					
	$n-1$	$n-2$	$n-1$	$n-2$	$n-1$	$n-2$	$n-1$	$n-2$	$n-1$	$n-2$	$n-1$	$n-2$	$n-1$	$n-2$	$n-1$	$n-2$				
Austria	-6.3	1.3	1.5	1.9	1.2	0.4	5.7	6.4	1.5	6.4	1.5	0.3	-5.1	0.3	22.6	9.4				
Belgium	-4.3	2.3	0.7	0.7	0.0	0.4	5.7	-0.8	5.0	-5.7	21.4	-4.7	2.0	-4.7	-2.2	25.0				
Cyprus	-5.8	-1.1	-8.1	-7.0	5.0	2.9	5.5	8.9	1.7	-0.5	-3.2	1.2	3.3	5.0	8.5	10.9				
Estonia	-11.2	-20.8	-0.3	5.0	5.7	2.9	5.5	8.9	1.7	-0.5	-3.2	1.2	3.3	5.0	3.1	3.1				
Finland	-8.9	-11.3	1.2	1.9	1.6	2.4	6.6	7.8	6.2	-4.6	-6.1	-3.7	8.7	11.3	13.4	13.4				
France	-3.2	-5.4	0.0	0.0	-0.4	3.3	3.3	5.6	3.7	-3.3	-6.0	-4.1	9.8	17.0	12.2	12.2				
Germany	-5.8	-7.1	3.1	0.8	1.3	0.5	1.1	4.6	0.8	-2.7	-3.2	-2.7	7.6	11.1	16.9	16.9				
Greece	-8.3	-7.1	-2.8	0.2	-2.8	0.2	11.6	8.2	-14.3	-8.0	39.4	50.1								
Ireland	-3.8	-8.1	3.1	-0.9	-0.5	-1.4	3.7	10.1	18.3	21.7	-7.3	-12.7	-20.5	-27.4	18.1	33.9	8.2	38.6		
Italy	-7.1	1.4	0.0	-1.2	0.0	-1.2	3.3	-0.1	-3.4	-0.9	11.0	3.4								
Latvia	-21.4	-0.9	-2.7	1.8	-2.7	1.8	7.5	5.6	-10.1	-3.8	28.6	1.4								
Lithuania	-19.3	1.8	-2.8	-1.9	-2.8	-1.9	6.4	4.1	-9.3	-5.9	13.0	18.1								
Luxembourg	-3.5	-9.4	3.5	1.7	6.6	0.7	1.7	8.2	-0.2	-0.1	-1.7	0.8	0.8	8.5	2.8	2.8				
Malta	-4.7	-5.7	1.0	-3.1	-1.3	-3.1	-1.3	1.9	-1.0	-1.7	-3.1	-2.1	5.7	10.4	7.7	7.7				
Netherlands	-5.1	-5.6	-0.6	-3.6	-4.2	-2.9	3.1	1.9	2.9	-6.6	-6.0	-5.8	17.2	13.8	21.3	21.3				
Portugal	-5.8	1.4	-2.4	-3.0	-2.4	-3.0	5.8	5.3	-8.3	-8.3	21.1	25.7								
Slovakia	-11.2	1.4	4.5	3.1	4.5	3.1	10.4	7.6	-6.0	-4.6	5.8	8.5								
Slovenia	-11.9	0.2	0.9	1.2	0.9	1.2	6.1	2.9	-5.2	-1.7	10.8	4.3								
Spain	-6.6	-1.2	-5.6	-2.1	-5.6	-2.1	6.6	2.5	-12.2	-4.6	20.8	8.5								
x	Mean																			
	-5.6	-9.8	0.2	0.9	0.2	-0.6	-0.7	-0.1	3.3	6.2	4.3	4.5	-3.6	-6.8	-4.9	-5.4	10.3	16.3	12.2	15.7

^a Difference between the prognosis and implementation in n ; the “-” sign means a growth that is slower than the prognosis.

^b Difference between the prognosis and implementation in n ; the “-” sign planned revenues higher than those executed.

^c The “-” sign deficit higher than planned.

Source: Own study based on data from Eurostat and European Commission.

and long-term perspectives. The obtained results of quantitative and qualitative research indicate that regardless of the introduced regulatory solutions at the EU level in the framework of the amended Stability and Growth Pact, we still observe some flaws of the economic policy coordination tools used at the European level. Generally, it can be concluded though that the reporting obligations and execution of the Treaty in terms of the shape of the national fiscal policy are treated seriously by the member states. The convergence programmes are a reliable tool, that is both the macroeconomic prognoses (GDP dynamics) and assumptions on the basic fiscal parameters correspond, to a large extent, to the actual state of the economy and the public finances. The course of the financial crisis that took place between 2008 and 2010, which entailed a high amplitude of macroeconomic variables and a necessity to undertake extraordinary actions in the field of the fiscal policy, naturally showed an inconsistency of the prognoses with the reality, but the last years show that these were extraordinary circumstances.

Concern may be raised by the fact that the European countries, while preparing the prognostic documents for the European Commission, have a tendency to hide the scale of the fiscal imbalance between the current balance of the sector and the increase in the public debt. For sure, it is necessary to deepen the coordination in terms of the public finances statistics in order to increase the transparency of the public systems and to increase the credibility of the data presented by given countries.

The conducted research did not allow to give a straight answer to an allegation often appearing in media and in current political debate that documents such as the Convergence programmes are a tool that is cynically used in the current policy. There is no confirmation that the governments repeatedly present fiscal parameters that are in line with the rules in order to actually conduct a fiscal policy that is fundamentally different than the one indicated in the documents submitted to the European Commission. In the case of drastic deviations of the prognoses from the implementation, such as in 2010 in Ireland (much higher expenditures, deficit and increase in the public debt) or Greece (dramatic increase in the debt that could

not be explained by a weaker GDP dynamics than planned), there are no reliable data allowing to clearly state whether it was a deliberate action of the governments in order not to show the European Commission and the financial markets how the situation is serious or rather the circumstances were changing so fast that the reality turned out to be significantly different from the prognosis.

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PROGRAMY KONWERCENCJI JAKO NARZĘDZIE POLITYKI GOSPODARCZEJ W UNII EUROPEJSKIEJ

STRESZCZENIE

W artykule zawarto wyniki badań wskazujące, na ile programy konwergencji przedkładane Komisji Europejskiej są faktycznie wyrazem pożądanej przez dany kraj korekty w polityce fiskalnej, a na ile są tylko wypełnieniem formalnego obowiązku bez faktycznej intencji osiągnięcia wskazanych parametrów makroekonomicznych. Przeprowadzone analizy pozwalają stwierdzić, że kraje europejskie przygotowując dokumenty prognostyczne, mają tendencje do ukrywania skali nierównowagi fiskalnej, co odzwierciedla brak spójności między bieżącym saldem sektora a przyrostem długu publicznego. Uzyskane wyniki badań ilościowych i jakościowych wskazują także, że niezależnie od wprowadzonych rozwiązań regulacyjnych na poziomie unijnym w ramach zmodyfikowanego pakietu stabilizacji i wzrostu wciąż widać pewne niedoskonałości wykorzystanych na poziomie europejskim narzędzi do koordynacji polityki gospodarczej.

Słowa kluczowe: prognozy makroekonomiczne, programy konwergencji, koordynacja polityki fiskalnej, Unia Europejska, pakt stabilizacji i rozwoju

CHANGES IN HUMAN CAPITAL RESOURCES IN THE LABOUR MARKET IN POLAND FROM THE PERSPECTIVE OF THE EUROPEAN UNION AND OTHER COUNTRIES

Janina Sawicka¹  , Paulina Stolarczyk²  

¹The State University of Applied Sciences in Płock

²Warsaw University of Life Sciences – SGGW

ABSTRACT

The theoretical part of the paper presents conclusions from the literature review. The empirical part of the paper includes findings of the research carried out by the authors. Amending the human capital definition, based on the new approach from the perspective of equal opportunities, mainly for women, was the main aim and added value of the paper. Based on the previous research, authors hypothesized that the equality of opportunities in the labour market, social life, education and public life generates economic benefits, while the lack of such equality causes losses. To prove that the equality of opportunities enhances the value of human capital, the authors carried out their own research and referred to the findings of other empirical studies, data from the Central Statistical Office, Eurostat and expert opinions from such institutions as the European Institute for Equality of Women and Men in Vilnius (EIGE) and the World Economic Forum, OECD.

Key words: human capital, labour market, equality of opportunities, women

INTRODUCTION

Samuelson defines human capital as the useful and valuable qualifications and knowledge acquired during the process of education and vocational training of the individual human being [Samuelson and Nordhaus 1980]. Individuals acquire these qualities, decide to invest in themselves in order to develop their work potential. Such investments include investment in e.g. education, long life learning and health improvement measures, as well as the cost of missed opportunities. The time spent on education could be used in other ways, e.g. for gainful employment. On the other hand, measures to improve health and well-being contribute to increasing productivity [Kryńska 2000].

Human capital can be regarded as a set of qualifications and skills, determining how advanced products or services can be produced by a given sector of the economy. This makes human capital one of the most important elements of economic processes, including economic growth and technical progress [Domański 2000].

The crucial importance of human capital for the economic and social development cannot be overestimated in any way. It is assumed that human capital influences social welfare, individual earnings of employees, efficiency and effectiveness of entrepreneurs, as well as the amount of added value generated by the national economy. The usefulness of the research is evidenced by the fact that, already in the

Janina Sawicka  <https://orcid.org/0000-0002-8181-1723>; Paulina Stolarczyk  <https://orcid.org/0000-0001-8094-1174>

 j.sawicka@pwszplock.pl; paulina_stolarczyk@sggw.pl

middle of the last century, it was believed that conducting economic growth analyses without determining the impact of human capital on this growth is a significant simplification. Presently published, modern scientific articles in this field confirm this thesis [Baron and Armstrong 2012]. The human capital definition contains not only areas of demography, labour market, but also: health, education, culture, science, technology and innovation [GUS 2017b].

MATERIAL AND METHODS

From the definition of OECD we know that: “human capital is a knowledge, skills, abilities and other relevant attributes that facilitate the creation of personal, social and economic well-being” [OECD 2001]. Our research objective is to add the perspective of equality opportunities and chances to the human capital value. We would like to investigate how the discrimination and lack of equal chances approach is not allowing to take advantage, for example, from the better education level for some group of people on the labour market.

The new approach and the goal and added value of this research is enrichment the definition of human capital with the perspective of equal opportunities and equal chances for different groups of people. Equality opportunities on the labour market and in social life bring economic benefits, while their lack – losses.

Our statement is that: improvement of the quality of human capital, understood as educated society, enjoying good health and tailored to the needs of the labour market could not be achieved without equal opportunities and chances approach.

For proving that equality of chances enrich the definition of human capital, the own research findings were used, with support from other empirical studies, data from Central Statistical Office of Poland (GUS), Eurostat and expert opinions from such institutions as European Institute for Equality of Women and Men in Vilnius (EIGE), World Economic Forum (WEF), Organisation for Economic Co-operation and Development (OECD).

DISCUSSION AND FINDINGS

The economic context of equality policy

The equality perspective is important in the economic dimension. There is a correlation between a higher level of economic growth and respect for equality rights, because a higher level of development consequently leads to progress in such areas as: education, culture or health care. There is also the reverse influence of a greater entitlement to economic development, because the greater is the activation of women, people with disabilities, people excluded from the labour market, the greater is the growth of domestic product through the use of larger labour resources in qualitative and quantitative terms. Equal opportunities bring economic benefits, and their lack generates losses [Sawicka (Ed.) 2013].

Equality contribute to increasing the competitiveness of the economy and better economic results, and is also a determinant introducing positive changes in society. The level of social awareness is increasing, contributing to breaking stereotypes. These changes cause the release of blocked human capital, which is women. Equal opportunities have a positive impact on the economic performance of the entire economy. It is expressed through the possibility of obtaining higher GDP. Apart from quantitative aspects, equal opportunities approach also have qualitative aspects, namely the aspect of diversity on the labour market. Therefore, arguments not only related to the issue of justice but also to economic efficiency argue for inclusion the issue of equal opportunities in the mainstream of all areas of society activities affecting quality of human capital as the primary economic resource.

Discrimination, as the opposite of equal opportunities, brings a decrease in economic efficiency. The situation in which the economic role of individuals is determined by gender or disability rather than by skills leads to mismanagement and not sufficiently using the skills of a given, discriminated group of women, in this case. In striving to eliminate discrimination and segregation, it is possible to achieve the development of human capital resources with different skills and thus improve the work organization process. The participation of, for example, women in the economy on

an equal bases with men, can also have a positive impact on family life if women's interests are supported by a policy promoting the balance between family and professional life.

Qualifications and skills adding value to human capital

Analysing the importance of human potential, Becker [1975] distinguished the theory of human capital. This theory introduces an additional element, which is the time devoted to investment in human capital, that is, the development of the individual in order to raise qualifications and skills. The increase in the value of human capital increases the opportunities for promotion, increase in salaries, employment stabilization and reduces the risk of discrimination. With time, a change occurred in relation to work, the type of work performed, as well as the possibilities of intellectual development, played an increasing role. The rapid development of modern technologies has resulted in increased demand for various types of training, bearing in mind that "active shaping of the labour supply structure by professional qualifications is one of the forms of employment policy instrumentalisation".

Nowadays the digital economy, internet use, advancing skills of workers. There are some indicators which allow to measure and compare the value of human capital [EU 2018]. The Digital Economy and Society Index (DESI) summarizes relevant indicators on Europe's digital performance and positioning the EU Member States. The human capital dimension of DESI has two sub-dimensions covering "basic skills and usage" and "advanced skills and development". The former includes indicators on internet use by individuals and digital skills. The latter includes indicators on ICT specialist employment and graduates in science, technology engineering and mathematics disciplines. According to 2017 data, the Netherlands, Sweden and Luxembourg are the top performers in basic skills and usage; Finland, Ireland, Sweden and the UK had the highest scores in advanced skills and development. Romania, Bulgaria, Greece and Italy rank the lowest overall on DESI's human capital dimension. Estonia is better than Poland, but scores are lower than average in UE.

Equality of opportunities and human capital value

Equality of opportunities on the labour market, in social life, in education and in public life bring economic benefits, while their lack – losses. The new approach and the goal and added value of our research is the enrichment of the human capital definition with the perspective of equal opportunities and chances.

At the beginning we comment some indicators using as measures of gender disparities and gaps. The Global Gender Gap Index is one of such a measures. Index was first introduced by the World Economic Forum in 2006 and since that time, every two years reports were published on gender-based disparities and progress over time [WEF 2018].

The last 2018 year edition of the report rang 149 countries on gender parity on a scale from 0 (disparity) to 1 (parity) across four thematic dimensions so call sub indexes such as: Economic Participation and Opportunity, Health and Survival, Educational Attainment, and Political Empowerment and allows for comparisons across and within income groups, countries and regions. The 2018 report's key findings: globally, the average (population-weighted) distance is at 68.0%, it means that there is still a 32.0% average gender gap. Across the four sub indexes, on average, the largest gender disparity is on Political Empowerment, with a gap of 77.1%. The second-largest gap is at Economic Participation and Opportunity at 41.9%, while the Health and Survival and Educational Attainment gaps are significantly lower at 4.6 and 4.4%, respectively.

All eight geographical regions assessed in the report have achieved at least 60% gender parity, and two have progressed above 70%. Western Europe is, on average, the region with the highest level of gender parity (75.8%). North America (72.5%) is second and Latin America (70.8%) is third. They are followed by Eastern Europe and Central Asia (70.7%), East Asia and the Pacific (68.3%), Sub-Saharan Africa (66.3%), South Asia (65.8%) and the Middle East and North Africa (60.2%).

The most gender-equal country is Iceland. It has closed over 85% of its overall gender gap. Iceland is followed by Norway (83.5%), Sweden and Finland

(82.2%). Although dominated by Nordic countries, the top ten also features a Latin American country (Nicaragua, 5th), two Sub-Saharan African Countries (Rwanda, 6th, and Namibia, 10th) and a country from East Asia (Philippines (8th). The top ten is completed by New Zealand (7th) and Ireland (9th) [WEF 2018].

The role of education and workers skills system have a tremendous influence on the human capital value. Not only formal education level where women use to be better educated than men, but the situation on the local labour market are important. The topic is how to bring together a suitably skilled potential workforce (supply) with the needs of employers (demand). The required workforce and the skills needed are determined by the economic activity and by employers' business strategies. The potential of workforce, human capital value on the market is determined by skills (by education and training, and lifelong learning systems) and by the activation (or participation) of workers in the labour market [ECDVT 2018].

With the rapid changes in today's labour markets, analysis also took a look at gender gaps in artificial intelligence (AI), a critical in-demand skill set of the future. Based on collaboration with LinkedIn, was find that only 22% of AI professionals globally are female, compared to 78% who are male. This gape has remained constant over the years and does not indicate a positive future trend [WEF 2018]. The implications of this finding are alarming because AI skills gender gaps may exacerbate disparities in economic participation in the future. Low integration of women into AI professions indicates a significant missed opportunity in supply and effective use of adequately qualified labour.

Gender pay gaps

A lot has been written on this topic and a many research across the world is aimed at explaining the reasons why men continue to be paid more, for similar job, than women. The 2018/2019 ILO *Global Wage Report* provides a detailed examination of gender pay inequalities [ILO 2018]. The second part of this report is devoted to the gender pay gap. The estimate covering 70 countries and about 80% of wage employees worldwide, show that on average women currently continue to be paid approximately 20% less than men.

Secondly, the report analyses and breaks down gender pay gaps to better understand what lies behind this figure. The evidence shows that, in fact, much of the gender pay gap cannot be explained by any of the objective labour market characteristics that usually underlie the determination of wages. In high-income countries, for example, almost all of the gender pay gap remains unexplained. So what could then be the factors that lie behind gender pay gaps? The report shows that education is not, in most countries, the main issue: women wage employees across the world have just as good, if not better, educational attainments than men. However, occupational segregation and the polarization by gender of industries and economic sectors stand out as key factors. Women continue to be under-represented in traditionally male-occupied categories and within similar categories women are consistently paid below men, even if women's educational attainments are just as good or better than those of men in similar occupations. Gender polarization is also an important factor: the report shows that in Europe, for example, working in an enterprise with a predominantly female workforce can bring about a 14.7% wage penalty compared to working in an enterprise with similar productivity attributes but a different gender mix [ILO 2018].

Women in Poland

Analysis of indicators by gender is the most illustrative way of describing the diversity in the labour market. Women and men use to work in other professions and sectors, they also have different average wages and working hours, which is beyond doubt, while problems arise from the persistent feminisation of certain industries and professions and the economic undervaluation of women's work (gender pay gap). One of the reasons for these differences is the historical and cultural conditions. The changing political system policy (support for democracy, including equality practices) also has a significant impact.

Statistical data (the table) at the national level presenting the situation on the labour market in Poland prove that the female population is characterised by lower economic activity and employment and a higher unemployment rate than in the case of men. The trend towards lower pay for women for the same work as men (gender pay gap) also remains unchanged. Lower

Table. Economic activity of the population in Poland aged 15 and more by sex and place of residence in the years 2010–2017 (%)

Year	Economic activity rate				Employment rate				Unemployment rate			
	females	males	rural areas	urban areas	females	males	rural areas	urban areas	females	males	rural areas	urban areas
2010	47.6	63.7	55.5	55.2	42.8	57.8	50.4	49.7	10.0	9.3	9.2	9.9
2011	47.8	64.0	55.7	55.4	42.8	58.3	50.4	50.1	10.4	9.0	9.5	9.7
2012	48.1	64.3	56.1	55.7	42.9	58.2	50.4	50.1	10.9	9.4	10.2	10.0
2013	48.2	64.4	56.1	55.8	42.8	58.2	50.3	50.1	11.1	9.7	10.4	10.3
2014	48.5	64.7	56.3	56.2	43.8	59.2	50.9	51.4	9.6	8.5	9.5	8.7
2015	48.4	64.6	56.0	56.3	44.7	59.8	51.6	52.2	7.7	7.3	8.0	7.2
2016	48.3	64.8	56.2	56.2	45.3	60.9	52.6	52.9	6.2	6.1	6.5	5.9
2017	48.4	65.2	56.5	56.4	46.1	62.0	53.5	53.8	4.9	4.9	5.2	4.7

Source: Own study based on Central Statistical Office of Poland (GUS) data.

wages not only increase the risk of financial dependence on others, they also increase the gender gap in the elderly population (women have lower or no any pensions).

The development of the economy after the Second World War and the left-wing equality policy resulted in an increase in women's economic activity. This is shown by the data on the share of women in the total economically active population. The economic activity rate in 1950 was about 31%, at the beginning of the 1970s it exceeded 40%, and since 2010 it has remained at the level of about 48%. Differences in relation to the male population remain unchanged and in 2017 it was 17 p.p. to the disadvantage of women. The largest difference in activity between women and men occurred in the age group of 21–44 years, i.e. in the younger group of the working age population. Women also work part-time more often than men, which is mainly due to bringing up children and caring for other dependants, i.e. 10.6% of women and 4.4% of men respectively [GUS 2018].

What characteristics of human capital are conducive to higher labour force participation? Being in the productive age, important for economic activity is only for the male population, while women, due to caring functions in families, have breaks in economic

activity. The most important determinant of high economic activity is education. In the population of people with higher education level, economic activity is the highest and the difference in activity between women and men groups is the lowest, only 4 p.p. F – 78%; M – 82%.

Comparison between 2011 and 2017 shows that in the working age group the number of working women decreased by 79 thousand, while the number of men increased by 90 thousand.

There are still some industries and occupations where women's work is predominant. In 2017 these were the following industries: health care and social welfare – 82% women's share; education 79%; hotel and catering 67%; other service activities – 66%; financial activities and insurance – 62%; arts, entertainment and recreation activities – 60%.

Unfortunately, these are also the least paid jobs. In 2016, the average gross monthly salary of women was lower by approximately 16%. Gender pay gap was the highest – 26% in the senior officials and managers' group.

The share of self-employed is still low (entrepreneurs): 16.8% of men worked on their own account and did not employ workers. Among women, this situation concerned less than 10%.

An analysis of unemployment shows that unemployment in Poland, similarly as in other European countries, systematically decreased and in 2017 the unemployment rate was 4.6% for women and 4.4% for men [GUS 2018].

How government policy in Poland influencing women situation

In 2016 from April, after 2015 successful election, Polish government introduced a large new child benefit, called “Family 500+”, with the aim to increase fertility from a low level and reduce child poverty. The benefit is universal for the second and further child.

That program is working not so long but there are some studies on the impact of this new benefit on female labour supply, not only using findings from Polish Labour Force Survey data, Central Statistical Office of Poland figures, but also researches using the sophisticated econometric methods [Magda et al. 2018].

The following expert opinion [Ruzik-Sierdzińska 2017] concerns the question whether the benefit granted to children under the “Family 500+” program – in the form in which it was introduced in 2016 – has effects on the labour market. First of all, it was examined whether the program influences the departure from the labour market parents (especially women) from families benefiting from the program.

Nobody dope that the program “Family 500+” effecting positively the economic situation families with children. But in its present form, as the available analysis of Eurostat and BAEL GUS (Central Statistical Office of Poland) data allows to state, that the current structure of the “Family 500+” program is inappropriate, because one of the effects of paying this benefit is the departure from the labour market of 20–33 thousand women. The labour market participation rates of women with children decreased after the introduction of the “Family 500+” benefit, compared to childless women. The effect was higher among women with lower levels of education and living in small towns. In a long ran, it is known that longer interruptions in occupational activity negatively affect the future chances on the labour market and later, the amount of retirement pension, or not any pension for them. From January 2019, woman not working professionally and

having at least four children, will obtain pension on social minimum level.

The another objective of the program “Family 500+” is to increase in Poland fertility rate. The question is does the program influence positively increase fertility from a low level?

There is a positive relationship between fertility and the employment rate of mothers in Europe. More children are born in countries where women are more active in the labour market and less where women find it difficult to combine work with homework and raising children.

Differences in the rate of female employment and fertility rates between developed countries are explained by the availability of institutional childcare, labour market flexibility, parental and parental leave policy or the dominant model of relationships in a given country with a more or less partner-like division of household responsibilities.

It will also be interesting to assess whether fertility is influenced positively by the benefit, as intended by the Polish government. It was expected that the child birth will grow about 200 thousand. Up to now, the changes are not so visible: in 2017 child birth grow up to 12 thousand and in 2018 fold down by 10 thousand.

In other developing countries the birth rate rising with the booming economy, the general rise in incomes, the improved labour market situation and better access to childcare services. All this is helping to make it easier for families to have more children. But is a longer way.

In developed countries, which have been changing the economic model of the family, for a longer time, women specially this better educated want to be implemented in the labour market. Governments know that the easier way to increase the number of children is to help parents reconcile their professional and family roles. Among European countries, Sweden offers the best conditions for combining work and family responsibilities, including: family policy facilitating reconciliation of work and raising children (allowances, kindergartens), labour market regulations allowing for greater employment flexibility, and social standards supporting the partnership-sharing of care responsibilities between parents.

CONCLUSIONS

In the article, in their part concerning theoretical issues, conclusions from the literature review were presented and in the empirical part, however, own analyses and evaluations were done. The new approach and the goal and added value of the research was the enrichment the definition of human capital with adding the perspective of equal opportunities mainly for woman, approach. From previous research, the authors hypothesized that: equality of opportunities on the labour market, in social life, in education and in public life bring economic benefits, while their lack – losses. The new approach and the goal and added value of the research was the enrichment of the human capital definition with the perspective of equal opportunities and chances equality for different groups of people.

The discussion, materials and statistical data of the Central Statistical Office of Poland and Eurostat, comparisons of the European Union countries, as well as the situation in Poland presented against this background, are aimed at showing the economic dimension of the consequences of the existing in equalities between women and men on the labour market for human capital resources. There is a clear correlation between the country's higher level of economic development, respect for democratic rights in the area of gender equality, which, on the basis of feedback, contributes to a higher level of human capital and, consequently, to progress in every area of economic and social life. This applies both to the economy, education and culture, and leads to greater economic equality, including the implementation of the democratic principle of equal opportunities. The existence of discrimination and inequalities in the labour market and the economic and social consequences of this state of affairs is documented by research and statistics. Attempts to solve this problem in different regions of the world are made with different intensity and effects. On a macro-scale, the activities of EU institutions, governments of some countries, social organizations and non-governmental institutions, the business sphere are noticeable. At the household level, on a micro-scale, having equal opportunities for women with men contributes to a more efficient allocation of family labour resources.

The main objective of the nations, institutions, business and societies is to build dynamic and inclusive economies that provide a future of opportunities for all. Future activities should be directed on closing economic gender gaps, fostering diversity and promoting inclusive growth. The aim is to strengthen the value of human capital on the labour market by increasing women's participation in the workforce.

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ZMIANY W ZASOBACH KAPITAŁU LUDZKIEGO NA RYNKU PRACY W POLSCE Z PERSPEKTYWY UNII EUROPEJSKIEJ I INNYCH KRAJÓW

STRESZCZENIE

W artykule, w części dotyczącej zagadnień teoretycznych, przedstawiono wnioski z przeglądu literatury, a w części empirycznej wyniki własnych badań. Nowym podejściem, celem i wartością dodaną jest podjęcie próby wzbogacenia definicji kapitału ludzkiego o perspektywę równości szans, w tym głównie kobiet. Na podstawie wcześniejszych badań przyjęto hipotezę, że równość szans na rynku pracy, w życiu społecznym, edukacji przynosi korzyści ekonomiczne, a ich brak straty. W celu potwierdzenia tezy, iż stosowanie w praktyce zasad równościowych wzbogaca wartość kapitału ludzkiego, wykorzystano zarówno badania własne, jak i inne badania empiryczne, dane Głównego Urzędu Statystycznego i Eurostatu oraz ekspertyzy Europejskiego Instytutu Równości Kobiet i Mężczyzn w Wilnie (EIGE), Światowego Forum Ekonomicznego (WEF) i Organizacji Współpracy Gospodarczej i Rozwoju (OECD).

Słowa kluczowe: kapitał ludzki, rynek pracy, równość szans, kobiety

GENERATIONS OF THE DEVELOPMENT OF IT OUTSOURCING IN POLAND

Jolanta Słonic¹  , Sabina Motyka² , Anna Kaczorowska³ 

¹ Lublin University of Technology

² Cracow University of Technology

³ University of Lodz

ABSTRACT

The paper presents a study on the development of IT outsourcing (ITO) in large organizations in Poland. Based on the generations of outsourcing development presented in the literature, an attempt was made to develop the generation of IT outsourcing. Three generations of ITO development have been identified. The main research assumption was formulated as follows: The development of the ITO industry is carried out in accordance with the generation order of ITO development. Three detailed assumptions were also formulated. Each of them was referred to activities and functions included in individual generations. In order to address the assumptions, questionnaire surveys of ITO companies were carried out. Our own studies and analyses made it possible to confirm the adopted main and detailed assumptions. Confirmation of the ITO development in line with the ITO generations testifies to the harmonious development of the industry. Possible directions for further research concern new forms of ITO services related to the third generation of the ITO field development.

Key words: IT outsourcing, Poland, generations of IT outsourcing

INTRODUCTION

Dynamic transformations related to globalization processes led to the transformation of the economy and sharpened the need to introduce modern concepts of enterprise management. Implementation of strategic decisions in conditions of intensive development, growing competition and recurring crises contributed to the growth of enterprises' interest in outsourcing as a modern concept of enterprises management. There are many definitions of the IT outsourcing in the literature, starting from the definitions of Loh and Ventkatarman [1992] and Willcocks et al. [1995]. One of the definitions of outsourcing defines it as: "Management strategy, which consists in delegating duties and re-

sponsibilities for specialized tasks to an external company, most often not directly related to the company's profile. Thanks to the transfer of a function or process, the company has the opportunity to focus on the core business" [Szukalski and Wodnicka 2016].

In today's enterprises, IT outsourcing is now the norm, regardless of their size, the importance of ICT in their operations and the possession of their own material and personal resources in IT departments. Analysts and consultants at the national and international levels stress that IT outsourcing is still expanding its scope. The value of the global IT services market in 2013 amounted to USD 3.14 billion, of which 18.8% of the market value was generated by outsourcing services [Górecki 2016]. According to estimates of IT

Jolanta Słonic  <https://orcid.org/0000-0002-8869-5059>; Sabina Motyka  <https://orcid.org/0000-0002-1869-5870>; Anna Kaczorowska  <https://orcid.org/0000-0003-4372-5637>

 j.slonic@pollub.pl

market analysts, the prospects for the development of the IT services sector in Poland are very good. It is estimated that outsourcing services will develop very dynamically and will reach 21.9% share in the market of IT services by 2018. The most dynamically developing category will be services of infrastructure hosting and client application management, which will be mainly supported by the use of solutions in the cloud.

The growth in the value of the IT market and the growth of the IT outsourcing industry may be reflected in the increase of IT importance in enterprises. The purpose of the article is to check the correctness of the assumptions made. At the beginning, the identification of generation of IT outsourcing and their characteristics will be presented. Next, on the basis of identified generations, the main assumption and detailed assumptions will be formulated, which will be verified on the basis of own research and the conducted analyses.

THE DEVELOPMENT OF OUTSOURCING AND IT OUTSOURCING

The increase in the scope and size of IT outsourcing services was mentioned by many foreign authors of research already in the 1990s [McLellan 1995, Palvia 1995, Caldwell 1996, Lacity and Willcocks 1998]. They state that this increase will also take place in subsequent years, which they believe has been confirmed by the current results of the IT market analysis. The development of outsourcing is undertaken in publications of many authors. One concept of outsourcing development was presented by Kehal and Singh [2006]. The authors distinguished three generations of outsourcing development (Table 1).

Based on the presented concept of the generation of outsourcing, an attempt was made to develop the generation of IT outsourcing (Table 2).

Table 1. Generations of outsourcing development

Generation	Characteristics	Example
1	<ul style="list-style-type: none"> – Commissioned activities, processes and business functions are perceived as not belonging to key competences, are peripheral and were previously performed on their own – Supplier exercises control over commissioned activities, integration of partners is required – In the situation of the asymmetry of the size and strength of the organization, there is a tendency to favour the company performing the service – The main themes of application are cost and employment savings – Functions that were outsourced include payroll processing, security, cleaning, catering 	Rank Xerox, which in 1994 ordered the management of its properties to CBX Ltd., which was motivated by lower costs and higher quality of services. The contract included maintenance and management of real estate, security and catering
2	<ul style="list-style-type: none"> – It appeared in the mid-1980s – Actions similar to key competences are commissioned, having more strategic significance – The costs of effectiveness of actions are taken into account, but the more important motive is external access – Increased integration; outsourcing partners are in communication in order to achieve the synergy effect of resource and potential use – Organizations are looking for more than one partner wanting to increase strategic potential, prefer flexible cooperation – Maintaining necessary resources, conducting joint control of outsourced activities – Contracts have a certain degree of flexibility – Savings in total costs that increase revenue and profitability – In the automotive industry, outsourcing has shortened the life cycle of products, increased pressure not only to reduce costs, but also to improve quality and reduce the time of implementation of new models 	The phenomenon of commissioning by GlaxoSmithKline, Pfizer or Bayer (pharmaceutical companies), research services to specialist biotechnology companies. Customers' relations with service providers have changed, which due to their strategic nature have become partner relations.

Table 1 – cd.

Generation	Characteristics	Example
3	<ul style="list-style-type: none"> – Outsourcing covers activities previously recognized as key competences – The reason for the emergence of the generation is the constant and rapid development of technology – Generation is forced by the tightening of competitiveness and the need to quickly respond to customer needs in industries with intensive development; these are industries related to electronics (personal computers, mobile phones), fashion, and pharmaceutical – Outsourcing covers activities that create significant parts or entire value chains – Necessity to renovate the concept of own key competences in organizations 	<p>Virtual companies (Cisco System, Amazon, Dell) have commissioned most of the core business in their supply chains. Similarly, most of the clothing sector companies have evolved into companies designing and selling clothing collections. In contrast, virtually all production processes are performed by sub-suppliers with a cheaper work force.</p>

Source: On the basis of Kehal and Singh [2006].

Table 2. Generations of IT outsourcing development

Generation	Characteristics	Example
1	<p>Refers to business processes and functions not related to key competences. The main motive for using outsourcing was to reduce costs and employment by outsourcing simple and peripheral processes to suppliers. Among the functions that were outsourced were: projects for creating and modernizing applications, maintaining hardware and software.</p>	<p>EDS in the 1960s begins the implementation of contracts related to the storage of data of other companies. Customers want to achieve a greater return on investments in equipment purchase (hardware). The Polish state-owned enterprise ZETO (Electronic Works of Computational Engineering) established in 1964 in several large Polish cities. The company's task was to provide digital data collection and processing services from state institutions, organizations and enterprises. Then ZETO underwent many transformations. Branches in some cities have been closed, but to this day there are units which under the changed names provide IT outsourcing services.</p>
2	<p>Causes: the phenomenon of globalization (ordering production processes to countries where labour costs are lower) and widespread acceptance of the use of the Internet as a communication medium. Organizations have slowly begun to outsource processes similar to their key competences. The main reason was the growing competitive and rapid development of technology. These were cloud services.</p>	<p>IaaS (Infrastructure as a Service) – a model that provides the client with IT infrastructure (hardware), software and service. PaaS (Platform as a Service) – sale of a ready, often tailored to the needs of the user set of applications. It does not involve the need to purchase equipment or install software. SaaS (Software as a Service) – the client receives specific, selected software functions. CaaS (Communication as a Service) – the service provider provides a platform for telecommunication work environment. IPaaS (Integration Platform as a Service) – a platform that ensures integration between various services in the cloud. DaaS (Desktop as a Service) – in the model, the user buys from the hosted host a virtual machine, fully personalized and having exactly the specification that the client expects.</p>
3	<p>It covers part of the organization, it is a consequence of growing competition in sectors in which new technological opportunities are developing. These are some key functions, such as outsourcing of knowledge processes (knowledge process outsourcing KPO), shared services or global business services.</p>	<p>ITO development tendencies: automation and robotization, crowdsourcing, digital technologies, reverse outsourcing. The KPO's patron is India, which according to expert estimates accounts for 70% of industry revenues [Mishra et al. 2008]. Analysts in the IT market think that KPO can become a "Polish specialty", due to the competence and substantive preparation of employees (availability of qualified staff, the right number of researchers, knowledge of foreign languages) [Iwanicka 2016].</p>

Source: Own elaboration.

The development of IT outsourcing, similar to the previously presented development of outsourcing, takes place from the first generation, through the second to the third generation. The first generation appeared in the 1960s. Today, there is a second and third generation of ITO. However, organizations are beginning to use IT outsourcing from activities and functions included in the first generation. If they are satisfied with the application of the first generation ITO, they pass into the second and third generation. The use of IT outsourcing usually proceeds in accordance with the order of generation of ITO development, that is, from the first generation, through the second to the third generation.

RESEARCH OF ITO GENERATIONS

Purpose and method of research, research assumptions

The aim of the conducted research was to assess the state of development of the ITO sector in large organizations operating in Poland from the perspective of the ITO development generation. The main research assumption was formulated as follows: the development of the ITO industry is carried out in accordance with the order of generation of ITO development.

Based on that assumption, detailed assumptions were formulated. In the first one it was assumed that most organizations use forms of IT outsourcing included in the first generation, slightly fewer organizations use those included in the generation of the second, least organizations use forms of outsourcing included in the third generation. In the second, that most organizations use forms of IT outsourcing included in the first generation, fewer organizations use forms from the first and second generation in total, the fewest organizations use forms from the first, second and third generation combined. In the third, that the most intensive forms of IT outsourcing included in the first generation are used, while the ones classified to the second generation are less intensively used, the forms of IT outsourcing included in the third generation are least extensively used.

To assess the ITO development in Poland, a survey was carried out on a group of 200 large organizations, whose majority use ITO in their activities. The

questionnaire was a research tool. The questionnaire consisted of substantive questions and a data sheet regarding the organization under analysis and its IT department. Answers to questions were provided on the allocation scale. The answers were given by IT managers or IT specialists (76.5%) and other independent employees (23.5%). Statistic methods – licensed applications of Statistica 13.1 were used to develop the research material, MS Excel 2016 was used to prepare the graphs. The research was carried out in 2016.

It should be mentioned that in the literature of the subject, both in Polish and other languages, no studies of similar scope have been found.

Characteristics of the surveyed organizations

The research involved large Polish and foreign organizations operating in Poland. The vast majority were enterprises with Polish capital. The organizations were included in the large group due to the average number of employees – over 250 employees. Turnover was not taken into account because in some organizations this is sensitive or secret information. The organizations represented various industries: industry, trade, services, logistics, education / research / science. Their structure was almost even, with the exception of administration and non-profit organizations, which participated in the study at 2% (Fig. 1).

Almost half of the organizations surveyed were established in the years 1981–2000, i.e. during the economic transformation in Poland, around 15% were created after 2000 and 25% before 1981. These were usually independent organizations that did not form part of the structure of other entities. More than half were located in metropolises, about 5% were in special economic zones.

Taking into account the characteristics of the surveyed organizations, it can be assumed that they were diverse.

Reference to research assumptions

At the outset, activities and functions implemented using ITO were qualified for three previously separated generations of ITO development (Table 3).

In order to refer to the research assumptions using the available research material, statistical analyses



Fig. 1. Industry structure of organizations participating in the survey

Source: Own elaboration.

Table 3. Qualifying functions and activities for ITO generation

Generation	Functions and activities
1	A specific service or product offered to a specific sector Diversified services offered to diverse recipients Network & Telecoms
2	Infrastructure as a service Software as a service Platform as a service
3	Shared services and Centers of Excellence Global business services Employee outsourcing Outsourcing of a group of employees

Source: Own elaboration.

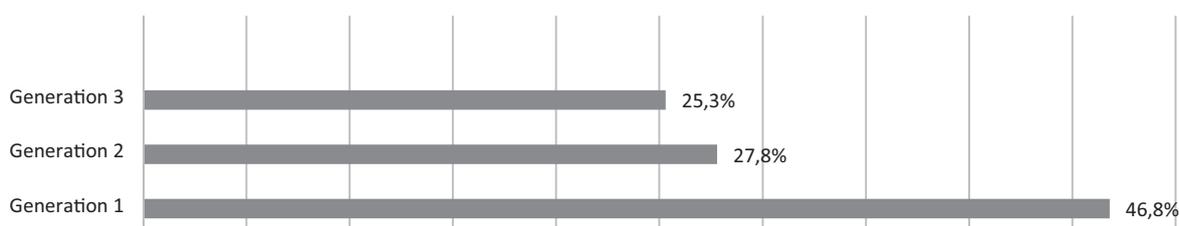


Fig. 2. The structure of organizations using ITOs from the first, the second and the third generations

Source: Own elaboration.

were performed and charts were made. Figure 2 presents the structure of the application of activities and functions included in individual generations of IT outsourcing.

Activities and functions included in the first generation of ITO were used by 46.6% of the surveyed

organizations, classified to the second generation by 27.8 and included in the third generation by 25.3% of organizations. The largest percentage of organizations uses functions and activities included in the first generation, a much lower percentage of organizations uses those included in the second generation,

the lowest percentage of organizations uses functions and activities included in the third generation of ITO. The data confirms the detailed assumptions that the majority of organizations use activities included in the first generation, slightly fewer organizations apply activities included in the generation of the second and the smallest organization applies activities included in the third generation. Differences between the use of activities and functions included in the second and third generation are small. The data confirm the first assumption.

Referring to the second assumption, the information on the application of activities and functions classified as first, first and second generation com-

bined, first, second and third generation is summarized Figure 3.

In the examined group of organizations, 111 used functions and activities included in the first generation, 55 applied those included in the first and second generation simultaneously, and 29 organizations used functions and activities included in the first, second and third generations simultaneously. This confirms the accuracy of the second assumption.

Figure 4 presents the intensity of application of individual functions and activities classified to individual ITO generations. The intensity of application of individual ITO services companies was measured by percentage ranges 1–20, 21–40, 41–60, 61–80 and

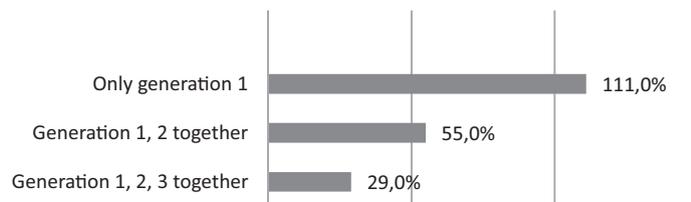


Fig. 3. Organizations that use ITOs from generations: 1; 1 and 2; 1, 2 and 3, number of organizations
Source: Own elaboration.

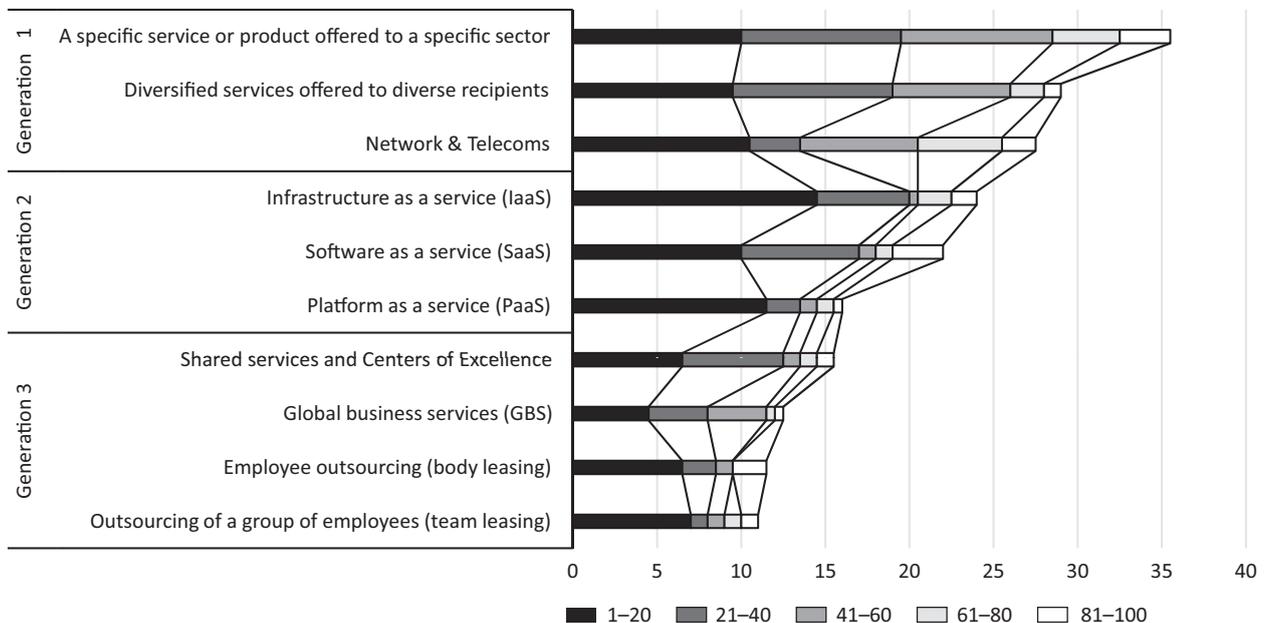


Fig. 4. The structure of the intensity of use of ITO services in the surveyed organizations (%)
Source: Own elaboration.

81–100%. The respondents had the opportunity to mark selected forms of services (from 1 to 10), therefore, the structures do not add up to 100%.

The largest percentage of organizations (over 35%) used a specific service or product offered to a specific sector. The phenomenon of specialization takes place here. The supplier specializes in the provision of specific services and may offer them at lower price, but with more professionalism provide a specific sector (higher quality, competitive price, competitive conditions). The second most frequently used service (about 30%) were varied services offered to diverse recipients. In the case of these services, the phenomenon of specialization also takes place when the supplier specializes in the provision of diversified but relatively non-advanced services and, depending on the customer's needs, selects them in various packages. The third most-used service was Network & Telecoms (27.5%). This service is a type of business communication that provides comprehensive service to the organization by providing business telephone systems, lines and traditional and broadband connections, mobile telephony, IT services and IT solutions supporting system operation. Network & Telecoms belongs to business services in the initial stages of development of these services. About 27% of the surveyed organizations used this service.

Network & Telecoms belong to business services in the initial stages of development of these services. Approximately 27% of the surveyed organizations used the Network & Telecoms service.

The three listed ITO services were included in the first generation. These services were used by the largest percentage of the surveyed organizations.

The next forms of ITO services were used less frequently and with less intensity than those previously mentioned. These were functions and activities provided in the computing cloud. They are included in the second generation. These are the order: infrastructure as a service used by 24% of organizations, software as a service used by 22% of organizations and a platform as a service used by 16% of organizations. IaaS is a service providing the client with IT infrastructure, software and the necessary service. The customer is responsible for the programming environment, application and drivers. SaaS consists in providing the cli-

ent with specific software functions selected by him. The service includes elements of IaaS and additionally a programming environment. PaaS is a service for delivering a set of applications tailored to the customer's needs. The supplier deals with hardware, operating system, programming environment and applications. This model uses a configured server that can be accessed from anywhere in the world.

The forms of services provided in the cloud, included in the second generation, were used by a smaller percentage of organizations and with less intensity than from forms of services included in the first generation.

The smallest percentage of organizations and the smallest intensity used the forms of outsourcing included in the third generation. This generation includes two ITO forms belonging to business services. These are: shared services and centres of excellence and global business services. Shared services and centres of excellence were used by 15.5% of the surveyed organizations, global business services by 12.5% of organizations. Shared services in the IT area include a statement by the organizational unit of the shared services centre (SSC) of IT services of an ancillary nature for two or more entities within one capital group. The centre may function as a separate service unit within a given enterprise or as a separate entity linked to a parent company in capital. It is estimated that over 80% of international enterprises have shared service centres. They are most often created in the financial and logistic industries. The development of information technology has contributed to the creation of shared service centres, as tasks have been made possible without the need for direct contact between the supplier and the recipient of the service. The use of shared service centres brings the following benefits:

- unification and standardization of procedures and processes;
- greater efficiency of work;
- enabling better knowledge sharing in the organization and exchange of experience;
- unification of IT systems;
- reduction of the time of implementation of activities;
- unification and improvement of internal control;
- shortening the time of preparation of reports.

Shared knowledge sharing processes within a single capital group follow shared services centres.

Center of a Excellence (CoE) is a team or a department that includes a team of employees whose goal is to collect, prepare, develop and implement best practices, initiatives and new proven methods. Activities are carried out to improve the functioning of the organization as a whole or part thereof and to improve financial performance.

Center of Excellence is presented by KPO by indicating and implementing the best practices, initiatives and proven methods. The functioning of CoE enables the emergence of economies of scale and proper separation of limited resources for the implementation of the most important projects.

Global business services (GBS) are integrated systems supporting corporate business units within a single organizational structure. The most important features of GBS are:

- sharing and sharing of infrastructure, including technology platforms, reduction of duplication of services;
- implementation of the entire business process, including business strategy in business processes. The implementation of the entire business process also enables greater standardization and automation of activities;
- implementation of activities important from the company's point of view and high value: enabling cooperation, using best practices, sharing specialist knowledge.

The last third generation of ITO also includes employee outsourcing and group employee outsourcing, also known as personnel outsourcing. They were used in the surveyed group by 11.5 and 11% respectively. The business environment of modern organizations is changing dynamically and therefore the demand for specialized IT services is growing. Outsourcing of an employee or group of employees allows you to relieve your own IT specialists and gives you a chance to take a new approach to your projects. Both forms provide the opportunity to acquire knowledge from outsourced consultants or teams of specialists. The team can include a team of developers, testers, team leader, project manager and analyst. In addition to a group of specialists, they have the appropriate

technological resources and communication tools. Personnel outsourcing is the most effective form of acquiring high quality specialists for the implementation of specific orders and projects. Tasks can be performed in the form of remote work.

Figure 4 illustrates the evidence of the third assumption. The most intensely used forms of IT outsourcing included in the first generation, slightly less included in the second generation, the third generation of IT outsourcing forms are least used extensively.

The main assumption and three detailed assumptions have been verified positively. Confirmation of detailed assumptions also proves the main assumption. The development of IT outsourcing in large organizations in Poland takes place in accordance with the proposed generations of IT outsourcing. The main motive for using ITO at the beginning of the service is to reduce costs and employment. The service refers to processes and functions not related to key competences. The development of technologies, especially services provided in the cloud, then prompts organizations to use activities and functions included in the second generation. Activities and functions included in the third generation are used by organizations that are satisfied with the use of activities and functions included in the first and second generation. Some functions of key importance are commissioned then.

The use of IT outsourcing in line with the generation's development generation testifies to the harmonious development of the industry in Poland.

DIRECTIONS FOR FURTHER RESEARCH

The development of the IT outsourcing industry makes the ITO research in the organizations of suppliers and clients of the service an issue of great theoretical and practical importance. ITO development trends: automation and robotization, development of digital technologies, the use of crowdsourcing, reverse outsourcing are new, possible research areas. IT outsourcing is rapidly changing due to the development of IT technologies themselves. Analysts in the IT industry confirm that ITO will continue to relate to transformations. Its functions and importance in the economy will grow.

SUMMARY

The article presents a study on the development of IT outsourcing in large organizations in Poland. The survey was conducted on a group of 200 organizations, the majority of companies with Polish capital or foreign capital operating in our country. Using the generations of outsourcing development described in the literature, an attempt was made to develop the concept of generation of IT outsourcing. Three generations have been specified in the development of the ITO industry: I – referring to processes and functions unrelated to key competences, II – regarding services provided in the cloud computing and III – covering some of the key functions in organizations. Based on the conducted analyses, the main assumption has been proved that the development of ITO in Poland follows the proposed generation of industry development. Three detailed assumptions were also verified positively. The first one: most organizations use activities and functions included in the first generation, slightly fewer of those included in the second generation and the least uses forms classified as third generation. The second: most organizations use ITO forms belonging to the first generation, fewer organizations use the first and second generation forms at the same time, the smallest organization uses forms belonging to three generations at the same time. The third: the most intensive (the highest percentage) are the forms belonging to the first generation, less intensively (smaller percentage), forms belonging to the second generation are used, the least intensive (the smallest percentage) forms belonging to the third generation are used.

Confirmation of the development of ITO in Poland in accordance with the proposed generations proves the harmonious development of the industry in large organizations in Poland.

The IT services industry is growing dynamically. New specialized forms of services appear. Services are also provided on the floors. The main reason for the changes in the industry is the development of information technologies. The importance of the IT industry in the economy on a national and global scale is growing. Possible research directions in the ITO

area are primarily new forms of ITO services related to the third generation of IT outsourcing.

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GENERACJE ROZWOJU OUTSOURCINGU INFORMATYCZNEGO W POLSCE

STRESZCZENIE

Artykuł przedstawia badanie rozwoju outsourcingu informatycznego (ITO) w dużych organizacjach w Polsce. Na podstawie przedstawionych w literaturze przedmiotu generacji rozwoju outsourcingu podjęto próbę opracowania generacji rozwoju outsourcingu informatycznego. Wyróżniono trzy generacje rozwoju ITO. Główne założenie badawcze sformułowano następująco: rozwój branży ITO odbywa się zgodnie z kolejnością generacji rozwoju ITO. Sformułowano także trzy założenia szczegółowe, w których szczegółowo odniesiono się do działań i funkcji zaliczonych do poszczególnych generacji. W celu ustosunkowania się do założeń przeprowadzono badania ankietowe firm – odbiorców ITO. Zrealizowane badania własne i przygotowane analizy umożliwiły potwierdzenie przyjętych założeń. Potwierdzenie rozwoju ITO zgodnie z generacjami ITO świadczy o harmonijności rozwoju branży. Możliwe kierunki dalszych badań dotyczą nowych form usług ITO, związanych z trzecią generacją rozwoju branży.

Słowa kluczowe: outsourcing informatyczny, Polska, generacje outsourcingu informatycznego

SPATIAL INTEGRATION OF VEGETABLE WHOLESALE MARKETS IN POLAND ON THE SELECTED EXAMPLE

Wioleta Sobczak¹  , Rafał Zbyrowski² , Bolesław Borkowski¹ 

¹ Warsaw University of Life Sciences – SGGW

² University of Warsaw

ABSTRACT

This article attempts to verify the phenomenon of price transmission between wholesale markets of carrots in Poland. Determining the level of spatial integration of markets will indicate their efficiency and thus can make it easier for producers to take decisions about where to sell their products. The empirical data includes daily quotations of carrot prices on fruit and vegetable wholesale markets in Bronisze, Kalisz, Poznań, Radom and Sandomierz. The time range of the studies covered the years 2011–2016. This research is based on dynamic econometric methods (sVAR model) and the Granger causality tests. The research carried out using dynamic econometric methods has shown that despite the occurrence of significant variation in the level of carrot prices in the examined markets, their interaction was observed. Moreover, the results of the sVAR model estimation indicate that the changes in carrot prices on a particular market are stronger influenced by the price changes from the same market. This is an autoregressive effect. It also means that the carrot price information coming from other wholesale markets (price transmission effect) has a much weaker effect.

Key words: price transmission, sVAR model, Granger causality test, wholesale market, vegetable prices

INTRODUCTION

The market for agricultural products is subject to the universal laws of market economy. However, it has specific characteristics which in many cases result in atypical market behaviour compared to other markets. Nevertheless, the most important principle shaping the level of prices on the agricultural products market is the law of supply and demand [Hamulczuk et al. 2012]. The price relationship between agricultural markets at the same level in the distribution chain is determined by horizontal price transmission. It consists of spreading, via impulses, of prices of a given product in different locations. This phenomenon is defined as the spatial transmission of prices [Fackler and Goodwin 2001]. In macroeconomic terms,

integration is a process of strengthening cooperation and connecting markets, which is made possible by eliminating economic barriers between these markets. Spatial market integration refers to the flow of price impulses and the existence of relationships between individual markets (price transmission). Market integration describes a situation where two conditions are met, namely: commodity prices in spatially separated markets change in parallel and signals and information are transmitted fluently between them.

Prices between two markets that trade with each other vary based on the magnitude of the markets' transaction costs and, in the case of markets between which there is no trade, these differences in prices may not be dependent solely on transaction costs [Tomek and Robinson 1981].

Wioleta Sobczak  <https://orcid.org/0000-0003-3812-3877>; Rafał Zbyrowski  <https://orcid.org/0000-0001-8499-8899>; Bolesław Borkowski  <https://orcid.org/0000-0001-6073-6173>
 wioleta_sobczak@sggw.pl

Spatial integration of markets provides an opportunity to create competitive conditions between markets where prices are mainly differentiated by transaction costs [Barrett and Li 2002]. Measuring market integration can become an essential tool in understanding how markets function [Ravallion 1986].

The fruit and vegetable market is an element of the agricultural market. However is distinguished by the existence of autonomous local markets, a high level of seasonality, a significant share of small, non-organised producers, and a wide range of products which differ in quality levels. In addition, large fluctuations in the level of prices, both in time and spatial cross-section, are an important feature. This leads to asymmetry in price transmission, and leads to lack of integration. Determining the level of spatial integration of markets will indicate their efficiency and thus make it easier for producers to make decisions about where to sell their products. The aim of this article was to assess the degree of spatial integration of wholesale fruit and vegetables markets in Poland on the example of carrot, in which Poland is a significant producer.

Wholesale markets play an important role in wholesale trade, which is the link between producers and retailers [Urban and Olszańska 2015]. One of the most important functions of wholesale markets is the price formation through the interaction of supply and demand forces. These markets and their operators are seen as an important element of trade in the agricultural sector, especially in relation to fruit and vegetables [Gołębiewski and Sobczak 2017]. Wholesale markets in Poland were established in the 1990s. These entities were an alternative to marts that dealt with wholesale trade of agricultural products which dominated the trade between producers and retailers in the first years after the transformation. At the same time, the position of existing entities, i.e. cooperatives, was significantly weakened and eventually their place was taken by new entities specialising in wholesale trade [Chojnacki 1999].

MATERIAL AND METHODS

In order to determine the spatial integration of wholesale markets, we used daily prices of carrots sold at five wholesale markets: Warsaw Agricultural-Food Wholesale Market and Wielkopolska Agro-Horticultural

Guild S.A. in Poznań, Sandomierz Horticultura Wholesale Market S.A., Agricultural-Food Wholesale Market Giełda Kaliska Sp. z o.o., Agricultural-Food Wholesale Market in Radom and Sandomierski Horticultural Wholesale Market S.A. The time period of the analysed prices (2011–2016) allowed minimising the impact of extraordinary changes in the supply of this commodity. Data on the price levels of carrots selected fruit and vegetable species were obtained directly from wholesale markets and the Polish Wholesale Markets Association.

In order to examine the stationarity of the time series for selecting the appropriate modelling methodology we have used an augmented Dickey–Fuller (ADF) test. The test (ADF) is based on a regression equation [Maddala 2008]:

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^k \gamma_i \Delta y_{t-1} + bt + \varepsilon_t \quad (1)$$

where:

- δ, b, γ – structural parameters estimated using the least squares method;
- k – number of lags;
- t – deterministic trend;
- Δy_{t-1} – the first differences of variable y in period $t - 1$;
- ε_t – residuals.

The null hypothesis for this test states that the y_t series is non-stationary (y_t has a unit root), while the alternative hypothesis states that the y_t series is stationary.

The type of process generating y_t has been also examined on the basis of the autocorrelation function (correlogram), which is in the form of [Box and Jenkins 1970]:

$$r_k = \hat{\rho}_k = \frac{\sum_{t=k+1}^T (x_t - \bar{x})(x_{t-k} - \bar{x})}{\sum_{t=1}^T (x_t - \bar{x})^2} = \frac{\sum_{t=k+1}^T (x_t - \bar{x})(x_{t-k} - \bar{x})}{TS^2} \quad (2)$$

where:

- t – time index;
- k – number of lags;
- \bar{x} – the average value of x .

In order to analyse the volatility of carrot prices on studied markets and to determine the existence of spatial integration, the structural model VAR (sVAR) was applied:

$$Bx_t = \Gamma_0 D_t + \Gamma_1 x_{t-1} + \Gamma_2 x_{t-2} + \dots + \Gamma_k x_{t-k} + \xi_t \quad (3)$$

where:

x_t – vector of the n variables in the model

$$x_t = [x_{1t} \dots x_{nt}]' \quad (4)$$

D_t – vector of deterministic components;

Γ_0 – matrix of parameters for variables in vector D_t ;

B – parameter matrix when variables of vector x_t are non-delayed:

$$B = \begin{bmatrix} 1 & b_{12} & \dots & b_{1n} \\ b_{21} & 1 & \dots & b_{2n} \\ \dots & \dots & 1 & \dots \\ n_1 & b_{n2} & \dots & 1 \end{bmatrix} \quad (5)$$

Γ_i ($i = 1, 2, 3, \dots, k$) – parameter matrices with delayed variables;

x_n, ξ_t – random disturbance vector of the structural model [Kusideł 2000].

The selection of lags was based on the Akaike and Schwarz information criterions.

The Granger causality test was used to analyse relations between the studied variables. Testing causality in the Granger sense is based on the following system of equations:

$$Y_t = \beta_0 + \sum_{j=1}^m \beta_j Y_{t-j} + \sum_{k=1}^n \beta_k X_{t-k} + u_t \quad (6)$$

$$X_t = \beta_0 + \sum_{j=1}^m \beta_j X_{t-j} + \sum_{k=1}^n \beta_k Y_{t-k} + u_t \quad (7)$$

where:

Y_t – values of the variable Y ;

X_t – values of the variable X ;

β – structural parameters of the model;

u_t – random component of the model [Granger 1969].

The null hypothesis in the Granger Causality test assumes that all β_k coefficients are equal to zero, which means that there is no causality, while the alternative hypothesis assumes the occurrence of causality in the Granger sense.

RESULT AND EMPIRICAL RESEARCH

This empirical study requires examining the stationarity of time series. The test results for the analysed time series are presented in Table 1. The calculated value of ADF test statistics is less than the critical value at each level of significance. Therefore, the null hypothesis about the non-stationarity of the time series for the examined carrot markets should be rejected.

For the time series investigated, autocorrelation and partial autocorrelation functions were generated. The generated autocorrelation functions have confirmed the stationarity of the carrot price series for selected wholesale markets. In this case, autocorrelation functions are expiring systematically and do not take on a sinusoidal shape (the figure). Studying the shape of the autocorrelation function is considered one of the non-formalised methods of testing the stationarity of time series [Kusideł 2000].

In the sVAR model, restrictions were imposed on pairs of parameters corresponding to wholesale

Table 1. Results of stationarity tests of time series of the examined prices of carrots

Wholesale market	ADF test statistics	The critical value for a p level of significance	
		p for 0.01	p for 0.05
Bronisze	-3.221	-2.568	-2.863
Poznań	-3.313	-2.568	-2.863
Kalisz	-3.169	-2.568	-2.863
Radom	-3.629	-2.568	-2.863
Sandomierz	-4.108	-2.568	-2.863

Source: Calculations and author's elaboration using the EViews program.

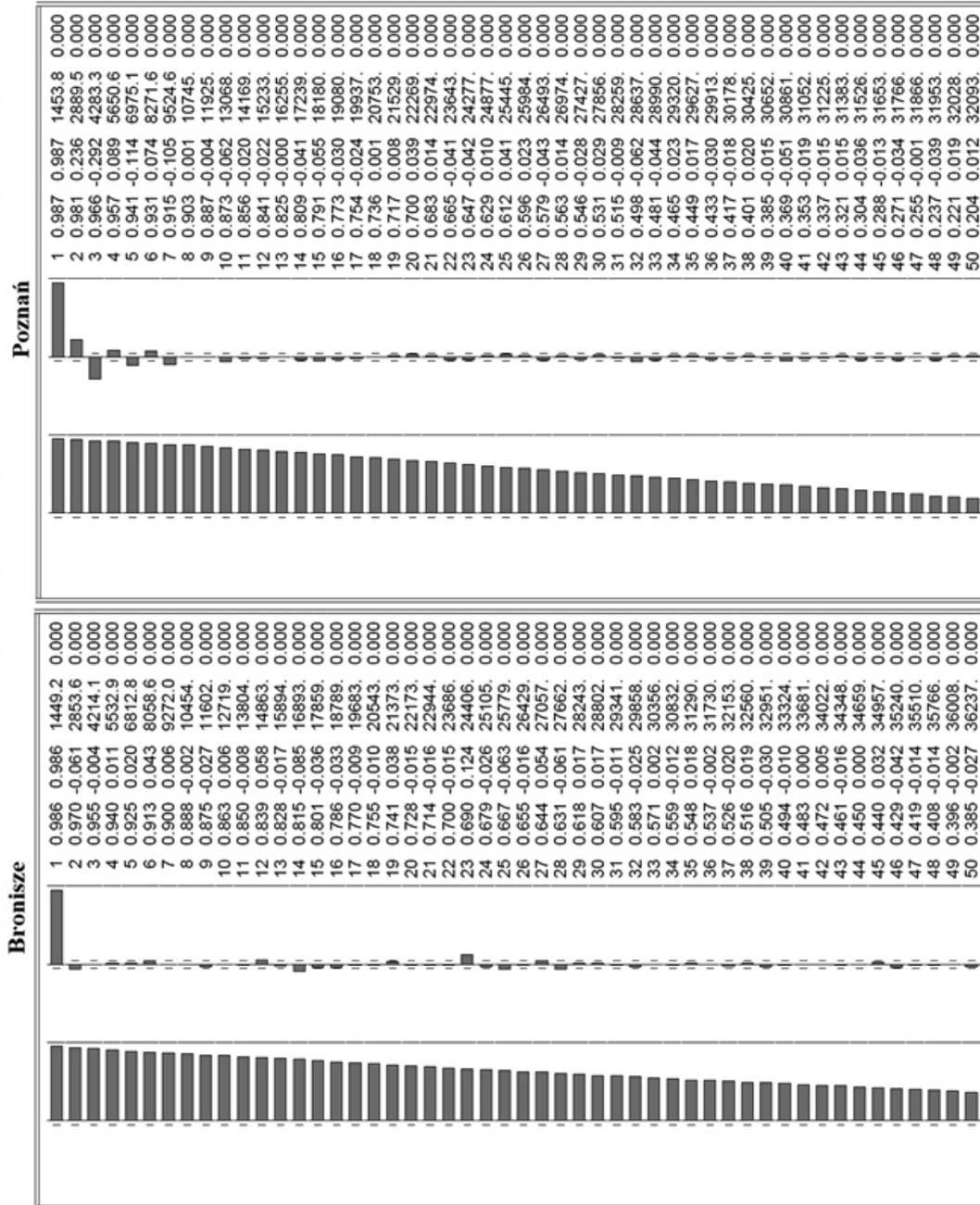
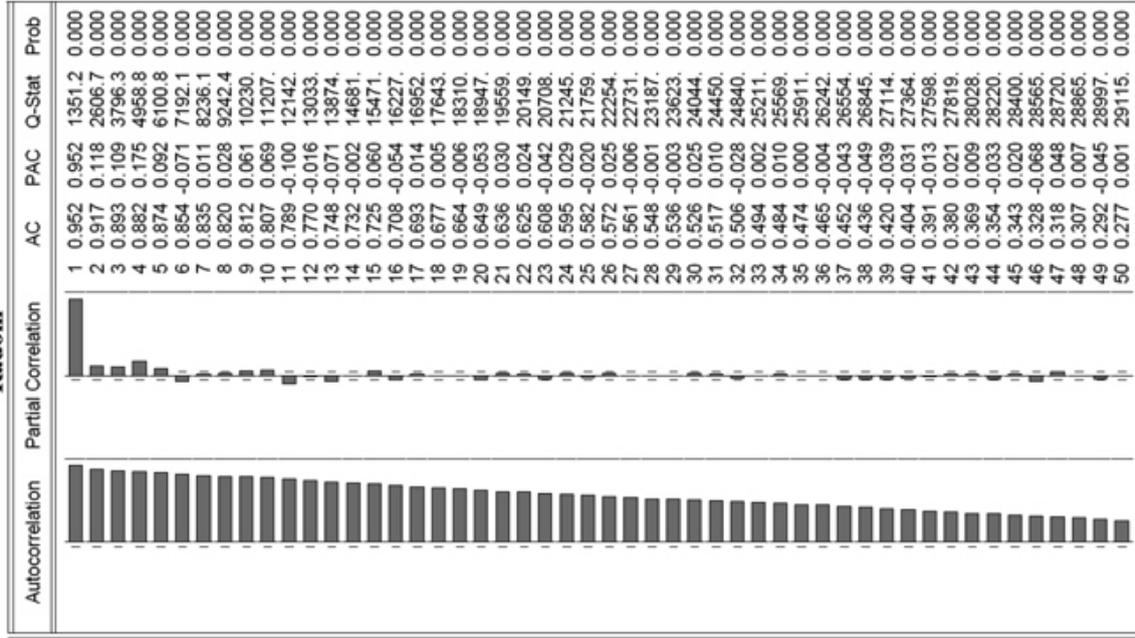
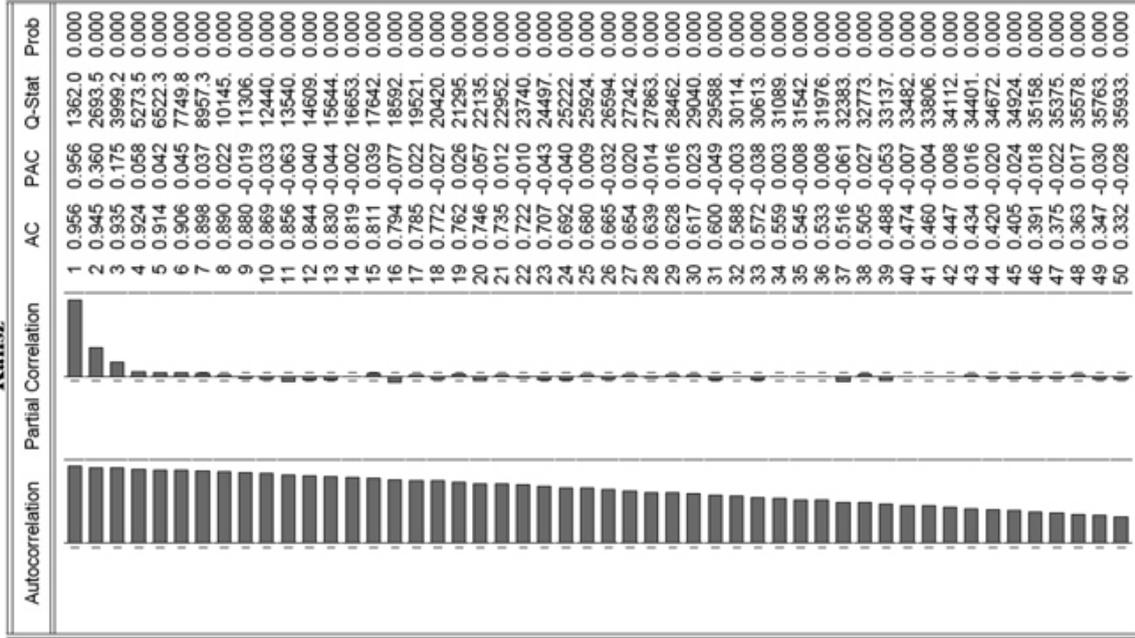


Fig. The autocorrelation and partial autocorrelation functions for examined time series
Source: Calculations and author's elaboration using the EViews program.

Radom



Kalisz



Sandomierz

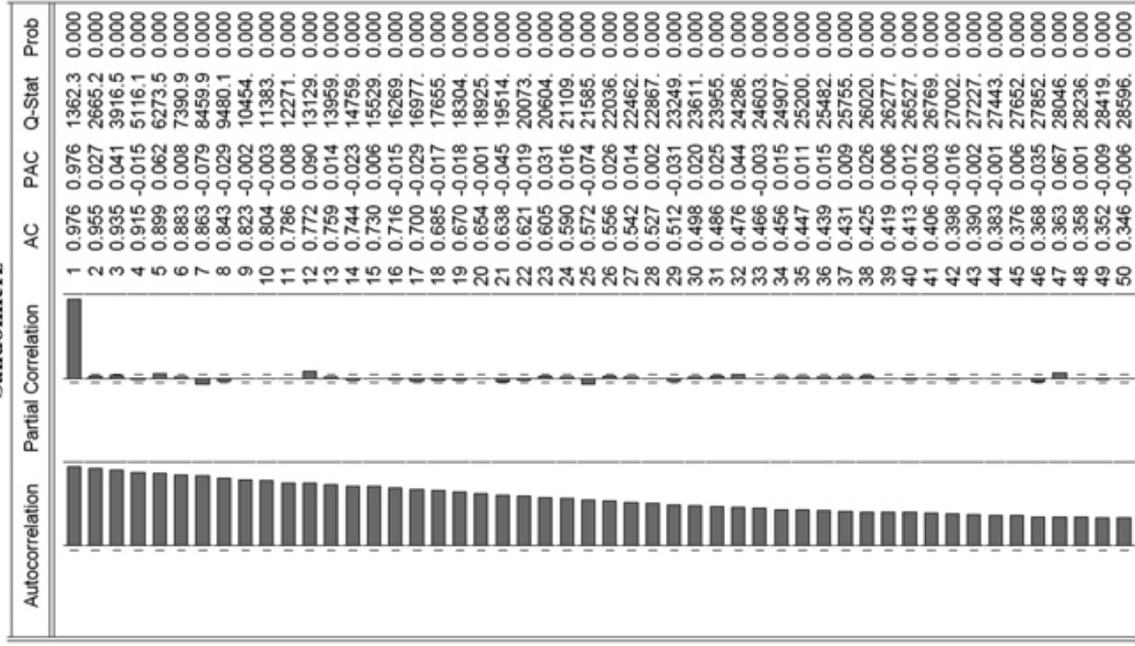


Fig. - cont.

markets with an insignificant exchange of goods. The estimated parameters of the sVAR model indicated the existence of carrot prices integration between all wholesale markets specified in the econometric model (Table 2). Most of the parameters of the sVAR model were statistically significant indicating that price changes in individual wholesale markets may not be independent (although this issue in VAR models cannot be considered on the basis of the t-Student test alone). Results of the estimation of parameters of the sVAR model showed that the price changes in the examined wholesale markets have positive correlation (for all statistically significant parameters). The exception was the dependency between carrot prices in Sandomierz and Poznań. It was observed that changes in carrot prices on a one of these markets are most sensitive to time delayed price changes

occurring on the same market (Table 2). On the other hand, carrot price changes recorded on spatially remote wholesale markets show a significantly lower impact on the level of carrot prices on a particular wholesale market. The results of the estimated sVAR model suggest that the volatility of carrot prices on the examined wholesale markets may be subject to spatial dependencies (price transmission) and autoregressive dependencies (the impact of historical prices on a particular wholesale market on its current value). As mentioned previously, the t-Student statistic is not a reliable test for statistical significance of parameter estimates in VAR and sVAR models. Thus, further testing using the Granger causality test was conducted.

Application of Granger causality test allowed us for characterising the dependencies in carrot price

Table 2. The parameters sVAR model estimates

Breakdown	Bronisze	Poznań	Kalisz	Radom	Sandomierz
Bronisze (-1)	0.963058	0.000901	0.077695	0.088304	0.018879
	(0.00819)	(0.00777)	(0.01720)	(0.01645)	(0.01087)
	[117.604]	[0.11598]	[4.5161]	[5.3687]	[1.7370]
Poznań (-1)	0.010626	0.954720	0.061378	0.082486	0.028025
	(0.00781)	(0.00701)	(0.01640)	(0.01485)	(0.01037)
	[1.36072]	[136.200]	[3.74183]	[5.55557]	[2.70182]
Kalisz (-1)	0.021183	0.021860	0.819543	0.036165	0.014687
	(0.00757)	(0.00734)	(0.01590)	(0.01554)	(0.01004)
	[2.79896]	[2.97990]	[51.5425]	[2.32748]	[1.46270]
Radom (-1)	0.008179	0.025491	0.043700	0.807311	-0.005437
	(0.00770)	(0.00746)	(0.01617)	(0.01580)	(0.01021)
	[1.06271]	[3.41757]	[2.70251]	[51.0999]	[-0.53243]
Sandomierz (-1)	-0.011941	0.000000	-0.009901	0.000000	0.931445
	(0.00635)	-	(0.01333)	-	(0.00850)
	[-1.87905]	-	[-0.74263]	-	[109.607]
R^2	0.972	0.976	0.917	0.909	0.955

Small approximation errors are displayed on grey background; standard deviation of results of t-Student statistics' are given in square brackets.

Source: Calculations and author's elaboration using the EViews program.

Table 3. Granger causality test results for carrot

Wholesale market	Bronisze	Poznań	Kalisz	Radom	Sandomierz
Bronisze	–	X (0.1049)	→ (6.E-08)	→ (1.E-17)	→ (0.0002)
	–	X (0.1976)	← (9.E-07)	← (0.0009)	X (0.8528)
Poznań	X (0.1976)	–	X (0.1445)	← (0.0184)	→ (0.021)
	X (0.1049)	–	→ (4.E-05)	X (0.0028)	X (0.955)
Kalisz	← (9.E-07)	→ (4.E-05)	–	→ (2.E-08)	→ (5.E-06)
	→ (6.E-08)	X (0.1445)	–	← (0.0002)	X (0.5105)
Radom	→ (0.0009)	→ (0.0028)	→ (0.0002)	–	→ (0.0003)
	← (1.E-17)	← (0.0184)	← (2.E-08)	–	X (0.7109)
Sandomierz	X (0.8528)	← (0.955)	← (0.5005)	← (0.7109)	–
	← (0.0002)	X (0.955)	X (0.5105)	X (0.7109)	–

p-value for the relevant test statistic, indicating acceptance or rejection of the null hypothesis for the Granger causality test are given in brackets; X means no causality in the Granger sense; ←, → show directions of causality in the Granger sense.

Source: Calculations and author's elaboration using the EViews program.

formation. Results of the Granger causality tests for carrot prices (Table 3) show the interaction of prices in most of the examined wholesale markets. Only in cases of the Warsaw Agricultural-Food Wholesale Market and Wielkopolska Agro-Horticultural Guild S.A. in Poznań, there was no dependency between carrot prices on these markets in 2011–2016.

CONCLUSIONS

The research based on dynamic econometric methods has shown that there are dependencies in the studied wholesale markets for carrot prices. This indicates the existence of price transmission between the analysed markets, thus suggesting that the analysed wholesale carrot markets were spatially integrated. This re-

search indicates that the largest Warsaw Agro-Food Wholesale Market S.A. in Bronisze influences the formation of carrot prices on all wholesale markets examined, with the exception of the Poznań market (Table 3). At the same time, it was stated that Sandomierz Horticultura Wholesale Market S.A. has the lowest degree of integration with other mentioned wholesale markets. In most cases it is only a “recipient” of carrot price information from other wholesales markets. Moreover, the results of the sVAR model estimation indicate that the changes in carrot prices on a particular market are stronger influenced by the price changes from the same market (autoregressive effect). It also means that the carrot price information coming from other wholesale markets (price transmission effect) has a much weaker effect.

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INTEGRACJA PRZESTRZENNA RYNKÓW HURTOWYCH WARZYW W POLSCE NA WYBRANYM PRZYKŁADZIE

STRESZCZENIE

W artykule podjęto próbę weryfikacji zjawiska występowania transmisji cen między rynkami hurtowymi w Polsce na rynku marchwi. Określenie poziomu przestrzennej integracji rynków wskaże ich efektywność, a tym samym może ułatwić producentom podejmowanie decyzji o tym, gdzie sprzedawać swoje produkty. Dane empiryczne obejmują dzienne notowania cen marchwi na rynkach hurtowych owoców i warzyw w Broniszach, Kaliszu, Poznaniu, Radomiu i Sandomierzu. Zakres czasowy badań obejmował lata 2011–2016. Do analizy wykorzystano metody ekonometrii dynamicznej (model sVAR) oraz przeprowadzono testy przyczynowości Grangera. Badania przeprowadzone z wykorzystaniem dynamicznych metod ekonometrycznych wykazały, że pomimo wystąpienia istotnych różnic w poziomie cen marchwi na badanych rynkach zaobserwowano ich wzajemne oddziaływanie. Ponadto wyniki oceny modelu sVAR wskazują, że na zmiany cen marchwi na danym rynku silniej wpływają zmiany cen z tego samego rynku (efekt autoregresyjny). Oznacza to również, że informacje o cenie marchwi pochodzące z innych rynków hurtowych (efekt transmisji ceny) mają znacznie słabszy efekt.

Słowa kluczowe: transmisja cen, model sVAR, test przyczynowości Grangera, rynki hurtowe, ceny warzyw

INTERDEPENDENCE OF ECONOMIC AND ENVIRONMENTAL EFFICIENCY IN AGRICULTURE IN THE EUROPEAN UNION

Jakub Staniszewski¹  , Andrzej Czyżewski² 

¹Poznań University of Economics and Business

²University of Zielona Góra

ABSTRACT

The aim of the study was to identify the most important determinants of economic and environmental efficiency of agricultural production in the EU countries in 2005, 2007, 2010 and 2013, with particular emphasis on structural conditions. The paper presents the results of modelling with the use of Eurostat data and methods of data envelopment analysis (DEA) and panel regression. In the case of economic efficiency, the importance of production concentration, understood as economic strength of farms, associated with an even distribution of production, was identified. In the case of eco-efficiency, its limiting factor turned out to be specialisation towards animal production. These results allow us to conclude that it is possible to achieve economic and environmental objectives at the same time, as none of the identified determinants was repeated in both models with the opposite sign. The results of the research are also a premise for the implementation of an active structural policy under the CAP after 2020.

Key words: economic efficiency, ecoefficiency, agriculture, DEA, panel regression

INTRODUCTION

The draft regulations defining the shape of the Common Agricultural Policy (CAP) after 2020 propose far-reaching changes in the model of its implementation. The reform is based on making the policy more flexible by transferring the majority of powers to the level of Member States. At the same time, the new CAP is to be more goal-oriented, thanks to the creation of a system of indicators and methods of their evaluation [Regulation of the European Parliament and of the Council COM/2018/392]. In this situation, decision-makers in the Member States face the challenge of increasing the macroeconomic efficiency of agriculture (at the scale of the agricultural sector). This process should be based on maintaining the cur-

rent production potential, while at the same time reducing engaged inputs, not only in economic, but also environmental terms. However, there are a number of doubts related to this process. To what extent is it dependent on structural factors, which change in the short term is difficult? Are the objectives of improving economic and environmental efficiency (eco-efficiency) not mutually exclusive? Which of the broad set of factors determine the level of efficiency to the greatest extent? The answers to these questions are provided by the analysis carried out in this study. In line with the new approach to evaluation of the CAP, comparisons have been made at Member State level. Taking into account the special role of structural factors [Kukuła 2010], the following hypothesis will be verified in the study: Structural conditions are an

important determinant of the level of economic and environmental efficiency of the agricultural sector of the EU countries, however, different dimensions of the structure affect other dimensions of efficiency. At the same time, on the basis of the literature review [Fuglie and Rada 2012, Wrzaszcz 2012, OECD 2013] a number of non-structural efficiency factors of exogenous, endogenous and institutional nature can be identified. Their impact will also be taken into account in the constructed models. The study was conducted on the basis of Eurostat data for the EU-25 (excluding Cyprus and Malta) in the years 2005–2013. The method of data envelope analysis (DEA) was used to measure the efficiency level, and panel regression to identify the dependencies.

MATERIAL AND METHODS

Data describing the shape of production structures in agriculture in the EU come from the farm structure survey (FSS), which was carried out in 2005, 2007, 2010 and 2013. Therefore, all other variables have been recalculated in order to be consistent with the methodology of this survey. A detailed description of the structural variables used in the survey is presented in Table 1. The concentration level was measured by the standard concentration index [O'Donnell et al. 2016] (variables UAA_SO, SO_SO, AWU_SO, LSU_SO). To measure specialisation we used Hirschman-Herfindahl index (UAA_TYPE, AWU_TYPE, LSU_TYPE, ABS_SPEC) and Krugman index (REL_SPEC) [Palan 2010].

Table 1. Structure measures used in the research

Feature	Code	Description
Concentration	AVG_UAA	average farm area (UAA)
	AVG_SO	average economic size of the holding (SO)
	AVG_AWU	average labour input (AWU)
	AVG_LSU	average number of livestock on the holding keeping the animals (FT45, 46, 47, 48, 51, 52, 53, 73, 74, 83, 84) (LSU)
	UAA_SO	distribution of the land factor among holdings of different economic size (UAA/SO)
	SO_SO	distribution of production among holdings of different economic size (SO/SO)
	AWU_SO	distribution of the labour factor between farms of different economic size (AWU/SO)
	LSU_SO	distribution of livestock between holdings of different economic size, which were keeping animals (LSU/SO)
Specialisation	SELF_CONS	share of farms using more than 50% of production for self-consumption
	MIXED	share of holdings of the type mixed production in production (SO)
	UAA_TYPE	distribution of the land between holdings of different types (UAA)
	AWU_TYPE	distribution of the labour between holdings of different types (AWU)
	LSU_TYPE	distribution of livestock between holdings of different types (LSU)
	ABS_SPEC	absolute specialisation – distribution of production among different types of farms (SO)
	REL_SPEC	relative specialisation – distribution of production among different types of farms (SO)
Orientation	ANIMAL	the share of the value of animal production (ANIMAL OUTPUT) in the total value of agricultural production (AGRICULTURAL GOODS OUTPUT), in base, 2005 constant prices

Source: Own study based on Eurostat [accessed: 11.12.2017].

The efficiency of agricultural production in the EU Member States in economic and environmental terms has been estimated using the DEA method. It allows to define the production function (production frontier) by means of linear programming methods, and then to determine the measure of efficiency as the distance of a given decision making unit (in this case Member State) from this frontier. A detailed description of this method can be found in Färe et al. [1994]. The DEAP 2.1 program was used for the estimations. Certain inputs and outputs used for calculations are described in Table 2.

Panel regression was used to study the dependencies between structural variables and efficiency. A detailed description of this method can be found in studies by Dańska-Borusiak [2011] and Park [2011]. Estimates were made in the Gretl. In order to test the robustness of the proposed models, a number of control variables have been introduced to control for the other determinants of agricultural productivity. They are listed in Table 3.

In order to verify the hypothesis contained in the introduction, two main models of panel regression

were constructed, where as an explanatory variable were used: (1) economic efficiency of the agricultural sector; and (2) eco-efficiency of the agricultural sector. Due to the wide range of potential determinants, the basic difficulty of the study lied in narrowing down this spectrum. For this purpose, the following procedures were applied:

- for all explanatory variables coefficients of variation were calculated, and those regression factors for which their value was lower than 10 were excluded from the study;
- considering the fact that the key group are structural variables, in the first place models describing each of the dimensions of efficiency by concentration of production, land, labour, or livestock were generated. To describe the degree of concentration in each of the dimensions, five variants of the model were constructed with the following explanatory variables: (1) average value (AVG_XX); (2) concentration index (XX_SO); (3) average value and concentration index; (4) interactional variable (int_xx)¹; (5) all these variables. The model with the highest value of R^2 was adopted for further testing;

Table 2. Economic and environmental inputs and outputs of agricultural activity

Category	Metrics	Description
Economic inputs	labour	total agricultural labour input (40 000 AWU)
	capital	value of intermediate consumption (EUR 19 000) depreciation (EUR 21 000) at 2005 constant prices
	land	total utilised agricultural area in ha
Environmental inputs	GHG emission	CO ₂ emission, in tonnes N ₂ O, CH ₄ , HFC, PFC, SF ₆ , NF ₃ , in tonnes of CO ₂ equivalent
	nutrient balance	nutrient balance (N) in tonnes
	ammonia emission	annual NH ₃ emissions of agricultural origin, in tonnes
	livestock density	number of LSU per 1 ha of UAA
Output	production	value of plant and animal output (EUR 14 000), at basic prices (including subsidies for production) at constant 2005 prices

Source: Own study based on Eurostat [accessed: 07.07.2017].

¹ An interaction variable is created by multiplying two variables that are suspected of interaction, i.e. the impact of one variable depends on the value of the other variable.

Table 3. Determinants of agricultural efficiency – overview of metrics

	Category	Metrics	Code	Description
Endogenic	technology	capital/labour ratio	C/W	capital (intermediate consumption + depreciation) per 1 AWU
		capital/land ratio	C/L	capital (intermediate consumption + depreciation) per 1 ha UAA
		irrigation	IRRIG	share of irrigated UAA
	human capital	farmer's education	EDU_HOLD	share of UAA managed by farmers with basic or full agricultural training
		farmer's age	MED_AGE	median of the farmer's age
Egzogenic	infrastructure	internet	INTERNET	households on low population density areas (less than 100 people per km ²) with broadband access
	environmental conditions	less favoured areas	LFA	share of LFA in total UAA
	macroeconomic conditions	price scissors	PRICE_SC	the ratio of dynamics of average prices of food products to average prices of inputs used in agriculture
		economic growth	GDP	GDP growth in constant 2005 prices
		interest rates	INT_R	Maastricht criterion interest rates
		budget deficit	GG_DEF	general government deficit/surplus, expressed as a percentage of GDP
	Institutional	market orientation	other gainful activities	OGA
factors ownership		land rental	L_LEASE	share of leased land in the total UAA
		non-family labour	NON_FAM	share of labour (AWU) provided by non-family members, employed on the holding on a permanent basis
		loans	LOANS	share of interest costs in the total amount of capital costs (intermediate consumption + depreciation + investment expenditures)
agricultural policy		general subsidies	CAP_GEN	the total value of the subsidies per 1 000 SO
	investment subsidies	CAP_INV	the total value of the investment subsidies per 1 000 SO	

Source: Own study based on Eurostat and FADN [accessed: 17.11.2017].

- then, on the basis of the correlation matrix, structural variables not significantly correlated with the explanatory variables identified earlier were found and the impact of their inclusion in the model on its quality was tested. If quality increased, they could be included in the model;
- for the models estimated in this way, the adequacy of the estimator of the panel model (Hausman, Breusch–Pagan, F test) was tested. At this point, two models explaining the economic and environmental performance of the agricultural sector were selected for further research;

- in cases when the change of the estimator affected the significance of the previously selected regressors, the impact of their removal on the quality of the model was tested. In justified cases, insignificant variables were removed;
- for the models developed in this way, a robustness tests were carried out, consisting of the introduction of regressors representing non-structural efficiency factors into the model.

Due to the limited volume of work, only the models finally accepted for the research will be presented in the following section. All calculations are made using the Arellano robust errors (HAC) method. As a result of the described procedures, the following models were identified (Table 4).

Nine procedures were carried out for two dimensions of efficiency and four dimensions of agricultural production concentration. On the basis of these proce-

dures, two panel models explaining the variability of efficiency were constructed. In the case of economic efficiency, in all models, apart from those based on production concentration, the explanatory variables lost their significance after variables representing influence of individual factors characteristic for countries and periods were introduced into the model. For the model accepted for further calculations, the random effects estimator turned out to be the most adequate. This means that specific effects are not correlated with the explanatory variables of the model (as demonstrated by the Hausman test). In the case of models testing the impact of the concentration level on eco-efficiency, in the case of production and livestock, they were not significant even at the level of regression using the OLS method (pooled). In the case of the labour factor, although its average level in farms, initially turned out to be statistically significant, it lost its relevance

Table 4. Selection of structural factors for models – results

Economic efficiency				Ecoefficiency				
SO	UAA	AWU	LSU	SO	UAA	AWU	LSU	ad hoc
int_SO	UAA_SO	AVG_AWU, int_AWU	AVG_LSU	x	AVG_UAA, UAA_SO	AVG_AWU	x	AVG_SO, int_SO, int_AWU, SELF- CONS, REL_SPEC, ANIMAL
int_SO, AWU_SO, AWU_ TYPE, UAA_TYPE	UAA_SO, ABS_SPEC	int_AWU, SO_SO, AWU_ TYPE, LSU_TYPE, ABS_SPEC	AVG_LSU, AWU_ TYPE		AVG_UAA, UAA_SO, SO_SO, REL_SPEC	x		
int_SO, AWU_SO, AWU_ TYPE	x	x	x	x				ANIMAL, SELFCONS
random eff.								fixed eff.

row 1 – basic model; row 2 – model with additional structural variables; row 3 – panel model variables; row 4 – panel model estimator.

AVG_UAA – average utilised agricultural area; AVG_SO – average standard output.; AVG_AWU – average labour input; AVG_LSU – average livestock; UAA_SO – land distribution; SO_SO – standard output distribution; AWU_SO – labour input distribution; LSU_SO – distribution of livestock; SELFCONS – share of self-consumption; MIXED – share of mixed production; UAA_TYPE – distribution of UAA between different types of production; AWU_TYPE – distribution of labour between different types of production; LSU_TYPE – distribution of livestock between different types of production; ABS_SPEC – specialisation in absolute terms; REL_SPEC – specialisation in relative terms; ANIMAL – share of animal production.

Source: Own study based on Eurostat.

when other structural variables were introduced into the model. The model estimated for the concentration of labour factor was no longer valid after the use of panel estimators. In this case, an alternative method was applied, which consisted in a stepwise elimination of structural variables from the panel model with fixed effects. As a result, we obtained model explaining the differentiation of eco-efficiency by means of structural variables describing specialisation.

In addition, a binary variables were introduced to the models. In random effects model it describes whether the country joined EU after 2004 (EU-12). In fixed effects model binary variables represent country-specific effects. In order to eliminate the risk of burdening the estimation results with heteroskedasticity of variance or autocorrelation of a random component, a robust Arellano estimator has been used. The co-linearity of the finally included regressors was also verified by means of the variance inflation factor (VIF).

RESULTS

After receiving the basic versions of the models, robustness tests were carried out. First, the results obtained for economic efficiency will be discussed. Variables for robustness testing were selected with the method of backward stepwise regression, by removing from the model subsequent non-structural variables according to the key of their significance. Six variables which are strongly related to the economic efficiency of the agricultural sector have been identified. The impact of their control is shown in Table 5. According to the data presented there, the model showed significant robustness. The basic variable *int_SO*, showing the mixed impact of deconcentration and average economic farm size, proved significance at the level of $\alpha = 0.01$ in all models. Similarly, the *EU_12* binary variable describing the non-modelled characteristics differentiating EU-12 and EU-15 countries. The other variables representing concentration (*AWU_SO*) and specialisation (*AWU_TYPE*) of labour factor use lost relevance at the level of $\alpha = 0.01$ only after the *INT_R* variable representing interest rates was introduced. In the case of models (2) and (7), the Hausman test showed a higher adequacy of the model with fixed effects. The change in the estimator substantially affected the results of

the estimates, but in both cases the *int_SO* variable remained significant ($p = 0.011$ and $p = 0.025$, respectively). Out of the estimated models, only in case (2) the addition of a control variable improved the quality of the estimate (lower AIC, BIC and HQC values). At the same time, however, the model no longer required the GLS estimator, and after changing the estimator, it lost its predictive power.

As for the identified significant structural variables, the main one is *int_SO*, which illustrates the interaction between the average economic size of farm and concentration of production. It was constructed in such a way that it indicates that a positive impact on the economic efficiency of the agricultural sector is due to the high economic strength of farms, related to relatively even distribution of production. This means that the increase in the average size of farms through the enlargement of the largest units is less favourable than the enlargement of medium-sized farms. This variable may also be interpreted as an indication that the increase in average size of holdings will not significantly improve economic efficiency when agricultural production is too concentrated or that an even distribution will not be favourable if it concerns a sector with a fragmented production structure.

The other two structural variables concern the labour factor and their impact is negative. The variable *AWU_SO* illustrates the labour factor concentration. Negative sign means that, similarly as in the case of production, it is more advantageous, from the point of view of economic efficiency, for work to be distributed evenly among farms. If we assume that with use of modern technologies 1 AWU per holding is enough to handle production, high concentration may mean that in farms with above-average labour input, the labour-intensive production model dominates and it is unfavourable from the point of view of economic efficiency. The high value of the *AWU_TYPE* indicator informs about the specialisation of the use of the labour factor in farms of a certain type, which also turned out to be unfavourable for economic efficiency. Therefore, it turns out that specialisation, clearly positively assessed from the microeconomic perspective, from the macro point of view, may have the character of a destimulant. This effect may also be related to over-representation (in relation to other factors) of

Table 5. Robustness of the model for structural determinants of economic efficiency of agriculture (random effects, GLS, robust standard errors HAC)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
cons.	1.4*** (0.2)	1.34*** (0.2)	1.33*** (0.2)	1.33*** (0.19)	1.27*** (0.18)	1.39*** (0.19)	1.41*** (0.21)
int_SO	1.88e-6*** (4.9e-7)	2.33e-6*** (5.15e-7)	2.49e-6*** (7.48e-7)	1.02e-6*** (4.18e-7)	2.08e-6*** (4.66e-7)	2.68e-6*** (5.33e-7)	1.87e-6*** (4.85e-7)
AWU_SO	-0.66** (0.27)	-0.67*** (0.24)	-0.59** (0.28)	-0.45* (0.25)	-0.52** (0.26)	-0.65*** (0.23)	-0.66** (0.27)
AWU_TYPE	-0.53** (0.23)	-0.51** (0.21)	-0.49** (0.22)	-0.43* (0.23)	-0.40** (0.18)	-0.61** (0.25)	-0.54** (0.25)
EU_12	-0.18*** (0.04)	-0.16*** (0.5)	-0.18*** (0.04)	-0.17*** (0.048)	-0.18*** (0.043)	-0.22*** (0.043)	-0.19*** (0.043)
IRRIG		0.42** (0.17)					
INTERNET			-0.0003 (0.0004)				
INT_R				-0.02*** (0.003)			
GG_DEF					0.007*** (0.001)		
OGA						0.38*** (0.12)	
LOANS							-0.28 (0.82)
SE	0.1	0.093	0.1	0.111	0.108	0.108	0.106
AIC	-161.7	-184.1	-161.1	-148	-153.6	-152.8	-156.4
BIC	-148.7	-168.5	-145.5	-132.3	-138	-137.2	-140.75
HQC	-156.43	-177.8	-154.8	-141.6	-147.3	-146.5	-150.1
between	0.0113	0.006	0.0118	0.0113	0.012	0.012	0.01
within	0.0011	0.0011	0.0011	0.0007	0.0008	0.0009	0.0011
theta	0.84	0.79	0.85	0.88	0.87	0.86	0.84
Breush–Pagan	118.6 (1.28e-27)	78.53 (7.9e-19)	119.04 (1.02e-27)	117.6 (2.12e-27)	121.6 (2.8e-28)	120.6 (4.8e-28)	111 (5.86e-26)
Hausman	1.92 (0.59)	21.2 (0.0003)	2.11 (0.71)	8.53 (0.062)	9.4 (0.052)	5.4 (0.25)	10.64 (0.031)

int_SO – interaction of deconcentration and average farm output; AWU_SO – labour factor concentration; AWU_TYPE – specialisation of the labour factor; EU_12 – country joining the EU after 2004 (binary variable); IRRIG – irrigation; INTERNET – broadband internet availability in rural areas; INT_R – interest rates; GG_DEF – budget deficit; OGA – additional income sources; LOANS – credits widespread; AIC – Akaike information criterion; BIC – Bayesian information criterion; HQC – Hannan–Quinn information criterion.

*Significant at $\alpha = 0.1$; ** $\alpha = 0.05$; *** $\alpha = 0.01$. In brackets for the coefficients of the standard errors values, in brackets for the tests the p -value.

Source: Own study based on Eurostat.

labour in specific types of agricultural activity, which may imply labour-intensive production methods, and thus lower efficiency of the sector. In the context of both variables, it should also be noted that their occurrence in the model is a premise of great importance of the structure of the labour factor.

As for the second of the analysed efficiency dimensions – eco-efficiency, the search for its determi-

nants among the variables describing the concentration of production was unsuccessful, which resulted in the need to use an alternative method of selecting variables for the model. The procedure of backward stepwise regression was used, where by reducing subsequent insignificant variables, the model in version (1) was finally obtained (6). Diagnostic tests of the panel indicated that in such situation the estimator of

Table 6. Robustness of the model for structural determinants of eco-efficiency of agriculture (fixed effects, robust standard errors HAC)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
cons.	0.91*** (0.11)	0.92*** (0.11)	0.88*** (0.12)	0.97*** (0.11)	0.93*** (0.10)	0.94*** (0.11)	0.93*** (0.1)
ANIMAL	-0.52** (0.23)	-0.52** (0.24)	-0.45* (0.25)	-0.57** (0.23)	-0.57** (0.21)	-0.48** (0.23)	-0.36* (0.2)
SELFCONS	0.11** (0.5)	0.11** (0.5)	0.11** (0.5)	0.09 (0.5)	0.12** (0.5)	0.08 (0.5)	
C/L		-2.26e ⁻⁶ (1.6e ⁻⁵)					
INTERNET			0.0001 (0.0002)			0.0004* (0.0002)	0.0005** (0.0002)
NON_FAMILY				-0.1 (0.07)		-0.27** (0.1)	-0.36** (0.08)
CAP_INV					0.0004 (0.0002)	0.0004 (0.0002)	0.0004 (0.0003)
SE	0.026	0.026	0.026	0.026	0.026	0.025	0.026
AIC	-421.6	-419.6	-420.4	-421.1	-424.8	-428.1	-426.26
BIC	-351.28	-346.7	-347.5	-348.1	-351.85	-349.9	-350.7
HQC	-393.15	-390.11	-390.9	-391.5	-395.3	-396.42	-395.7
LSDV R ²	0.991	0.991	0.991	0.991	0.991	0.992	0.992
within R ²	0.131	0.131	0.138	0.144	0.175	0.233	0.203
F test	371.323 (4.49e ⁻²⁸)	732.15 (2.5e ⁻³¹)	200.11 (2.17e ⁻²⁴)	223.3 (4e ⁻²⁵)	186.75 (3.9e ⁻²⁴)	230.3 (2e ⁻²⁵)	55.6 (2.7e ⁻⁶)
Durbin-Watsons	1.48 (0.013)	1.49 (0.002)	1.52 (0.006)	1.49 (0.004)	1.54 (0.006)	1.7 (0.003)	1.64 (0.017)

ANIMAL – share of animal production; SELFCONS – share of farms with dominating self-consumption; C/L – capital/land ratio; INTERNET – availability of broadband Internet in rural areas; NON_FAMILY – share of non-family labour input; CAP_INV – CAP investment support.

*Significant at $\alpha = 0.1$; ** $\alpha = 0.05$; *** $\alpha = 0.01$. In brackets for the coefficients of the standard errors values, in brackets for the tests the p -value.

Source: Own study based on Eurostat.

fixed effects is the most adequate. Such a construction makes it impossible to introduce to the model binary variables other than those describing individual effects (the problem of strict collinearity). The remaining control variables were subjected to a procedure analogous to that concerning structural variables. On this basis, four control variables were identified, which are characterised by a particularly high correlation with the eco-efficiency of agriculture. With the use of this set of regressors, model robustness tests were carried out, as illustrated in Table 6. Their results indicate that among structural variables the highest robustness was shown by the share of animal production (ANIMAL), which in all models was characterized by a significant, at least at the level of $\alpha = 0.1$, and a negative impact on eco-efficiency. The second of the studied structural variables, describing widespread of self-consumption (SELFCONS), turned out to be less robust and in two models (4) and (6) it lost its significance due to the introduction of the variable share in employment people not from the farmer's family (NON-FAMILY). Finally, this variable was also introduced into the model (6) which was of the highest quality (lowest values of AIC, BIC and HQC) and was adopted for the final conclusion. It includes insignificant variable (SELFCONS), due to the fact that its removal worsened the quality of the model, as evidenced by the estimation (7). For the same reasons variable CAP_INV, describing investment support under the Common Agricultural Policy, remained in the model. The impact of capital/land ratio (C/L) was also tested, but it did not prove to be significant in any of the configurations.

The correlations revealed between the variables lead to the following observations. Firstly, the most important variable for building eco-efficiency was the share of animal production. In countries where it was higher, the eco-efficiency was significantly smaller. This is in line with theoretical considerations and indicates a greater environmental footprint of this type of production. On the other hand, it should be taken into account that the eco-efficiency was estimated on the basis of statistics (GHG emissions, stocking densities, ammonia emissions) arising to a large extent from the size of the animal population, hence the negative impact of this type of production may be

over-represented in the eco-efficiency index. However, this flaw results mainly from the lack of other measures of the impact of agriculture on the environment, available in a sufficiently long time horizon. This leads to the conclusion of a technical nature, that in order to better investigate the relationship between eco-efficiency and agricultural structure, a more complete set of data describing the development of the eco-efficiency is necessary. Secondly, the negative impact of livestock production becomes more important under conditions of controlling the impact of self-supply production (inclusion of the SELFCONS variable in the model). This may mean that the maintenance and production of livestock on such farms is less burdensome for the environment than on specialised farms. The SELFCONS variable becomes irrelevant due to the control of the level of employment in the holding of people not from the farmer's family (inclusion of the NON_FAMILY variable in the model), which turns out to have a significant negative impact on eco-efficiency.

SUMMARY

The estimated model of panel regression with random effects (RE), as the most important determinant of the economic efficiency of the agricultural sector indicated a large average economic size of farms, connected with a relatively even distribution of production (lack of polarisation). Apart from them, the relation with specialization in the use of labour factor (concentration of factor in one type of farms) was also important, as a destimulant. The model additionally indicated that even after excluding the impact of the above variables in the EU-12 countries, economic efficiency still remained significantly lower. The estimated panel regression model with constant effects (FE) indicated, as the most important determinant of eco-efficiency, the higher share of animal production, which had a negative impact. The other tested structural and control variables did not show a permanently significant relationship. However, the best of the estimated models indicated a positive impact of Internet availability and negative impact of non-family employment. At the same time, individual effects of particular countries were

distinguished in this model, which in the vast majority were significant. It means that the level of eco-efficiency depends to a larger extent on individual, immeasurable features of the agricultural sector in particular EU countries.

The obtained results of the research correspond only moderately to the conclusions of similar studies. As far as the relationship between economic efficiency and concentration is concerned, earlier studies have rather indicated a positive impact of the production scale [Huffman and Evenson 2001, Bojnec et al. 2014] on efficiency or lack of a statistically significant relation [Vollrath 2007, Nowak et al. 2015]. Differences in results may come from differences in the temporal and spatial range of research and different ways of defining concentration. In this study, it is broadly understood and takes into account the distribution of resources, not only their average level. In terms of eco-efficiency, earlier works indicated rather a positive correlation with animal production [Wrzaszcz 2012, Cupo and Di Cerbo 2017]. However, these analyses were conducted at the farm level, which may explain the discrepancies.

Comparing the results of the research on determinants of economic efficiency and eco-efficiency, the following conclusions can be drawn. Firstly, the differentiation of panel regression estimators for both types of efficiency allows us to state that in the case of eco-efficiency, estimated with the use of the constant effects estimator (FE), individual, unmeasurable features of the agricultural sector in individual countries were much more significant. Secondly, it can be noted that economic and environmental efficiency was stimulated by different features. In this situation, striving for efficiency in one dimension does not have to take place at the expense of the other, as none of the identified determinants was repeated in both models with the opposite sign. Therefore, the hypothesis stated earlier can be accepted. Thirdly, the explanatory variables identified in both models indicate that the economic efficiency of the sector is more closely related to the degree of concentration, while eco-efficiency to the direction of specialisation. All these conclusions justify the implementation of tools for restructuring the agricultural sector under the CAP after 2020.

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WSPÓŁZALEŻNOŚĆ EFEKTYWNOŚCI EKONOMICZNEJ I ŚRODOWISKOWEJ W ROLNICTWIE UNII EUROPEJSKIEJ

STRESZCZENIE

Celem badania było zidentyfikowanie najistotniejszych determinant ekonomicznej i środowiskowej efektywności produkcji rolnej w krajach UE w latach 2005, 2007, 2010 i 2013, ze szczególnym uwzględnieniem uwarunkowań strukturalnych. W opracowaniu przedstawiono wyniki modelowania z wykorzystaniem danych Eurostat i metod analizy obwiedni danych (DEA) oraz regresji panelowej. W przypadku efektywności ekonomicznej zidentyfikowano znaczenie koncentracji produkcji, rozumianej jako duża siła ekonomiczna gospodarstw, powiązana z równomiernym rozkładem produkcji. Czynnikiem ograniczającym efektywność okazała się specjalizacja w kierunku produkcji zwierzęcej. Wyniki te pozwalają wnioskować, że możliwa jest jednoczesna realizacja celów ekonomicznych i środowiskowych, gdyż żadna ze zidentyfikowanych determinant nie powtarzała się w obydwu modelach z przeciwnym znakiem. Wyniki badań stanowią też przesłankę do realizacji w ramach WPR po 2020 roku aktywnej polityki strukturalnej.

Słowa kluczowe: efektywność ekonomiczna, efektywność, rolnictwo, DEA, regresja panelowa

ASSESSMENT OF THE RELATIONSHIP BETWEEN INNOVATIONS AND ECONOMIC PERFORMANCE OF MANUFACTURING ENTERPRISES IN POLAND

Elżbieta Roszko-Wójtowicz✉, Iwona Laskowska, Maria M. Grzelak

University of Lodz

ABSTRACT

Long-term economic growth is based on innovations, and these depend, among others, on investments in research and development (R&D). The aim of the paper is to measure and assess the impact of innovations on the competitiveness of manufacturing enterprises. Depending on the model version, sold production or gross value added were adopted as a measure of competitiveness. The study is based on the analysis of the Cobb–Douglas production function extended by a variable describing innovations (expenditure on innovative activity). The research process was implemented for the period 2009–2016 and is a contribution to determining the role of innovations in shaping the economic performance of enterprises. The set of input variables is based on statistical data published by the Central Statistical Office of Poland (GUS). A positive and statistically significant estimation of the autoregressive coefficient in both the sold production model and the gross value added model shows the dependence of the analysed categories on the results achieved in previous periods. The legitimacy of using dynamic panel data models has been confirmed empirically.

Key words: innovativeness, panel data models, Cobb–Douglas function, manufacturing divisions

INTRODUCTION

In the global world, in the era of knowledge-based economy, science, technology and innovations are an important element shaping competitive advantages of national economies.

Innovations are the subject of the growing interest of economic theoreticians and practitioners, as well as the subject of an increasing number of studies conducted by researchers. This is mainly due to the new perception of innovations as a factor determining the increase in management efficiency. Innovations have become another production factor apart from physical capital and labour.

The aim of the paper is to quantitatively assess the impact of innovations on the competitiveness of

enterprises in divisions of manufacturing. The following two research hypotheses have been formulated to achieve this aim:

- H1: Expenditure on process and product innovations is an important determinant of the value of sold production of manufacturing enterprises in Poland in the years 2009–2016.
- H2: Expenditure on process and product innovations affect financial performance measured by gross value added of manufacturing enterprises in Poland in the years 2009–2016.

As a measure of competitiveness, sold production or gross value added, depending on the model version, was assumed. The presented study is based on the analysis of the Cobb–Douglas production function

Elżbieta Roszko-Wójtowicz  <https://orcid.org/0000-0001-9337-7218>; Iwona Laskowska  <https://orcid.org/0000-0002-1657-5541>; Maria M. Grzelak  <https://orcid.org/0000-0003-4353-9893>

✉ eroszko33@gmail.com

extended by a variable describing innovations (expenditure on innovative activity). The analysis covers the period 2009–2016 and is a contribution to determining the role of innovations in influencing economic performance of enterprises.

Expenditure on innovative activity included expenditure on: R&D; the purchase of ready-made technology in the form of rights and documentation; machines, technical equipment and tools as well as means of transport; buildings and structures; personnel training related to innovative activity; marketing for new and modernised products, as well as the inflow of foreign direct investment, export and import. All variables measuring “monetary value” were adjusted and expressed in constant prices of 2009.

The research procedure was based on statistical data published by the Central Statistical Office of Poland (GUS).

THEORETICAL BACKGROUND

Innovativeness is not an end in itself, but it is a tool used to achieve a competitive advantage by individual companies, sectors of the national economy, regions, countries or groups of countries. Similarly, competitiveness is not treated as the ultimate goal of business entities. On the one hand, in microeconomic terms, it is a means to maintain or strengthen the market position and to achieve positive economic results by enterprises, and on the other hand, in the macroeconomic dimension, it serves to raise the standard of living of citizens by increasing consumption of various goods and improving the quality of the natural environment [Świtalski 2005, Roszko-Wójtowicz and Białek 2016].

Models of economic growth are the starting point of the analysis of the relationship between innovations and competitiveness. Innovations as a factor of economic growth are indicated, among others, in works of Schumpeter [1912, 1960], where the close relationship between innovations and entrepreneurship is emphasised. In the Schumpeterian model of endogenous innovation, the rational profit search and technology modernisation are the driving force of economic growth. Such an approach can also be found in contemporary models of economic growth [Aghion and Howitt 1998]. Research results [Aghion et al. 2005, Grzelak et al.

2017] show that long-term economic growth is based on innovations, and these depend, among others, on investments in research and development (R&D). Both theory and empirical studies confirm that competitive advantages of nations arise from the implementation of innovations [Porter 1990, 2008, Cantwell 2006, Doyle and Perez-Alaniz 2017, Peneder 2017].

Harrod and Domar were the first economists who formulated the concept of economic growth, which has become a permanent element of modern macroeconomics. Their models come from the Keynesian mainstream of macroeconomics. In the theory of macroeconomics, after the Keynesian models of economic growth, neoclassical models appeared, among which the Solow-Swan model, in which a time variable which reflects the exogeneity of technological progress is introduced into the classical production function (of the Cobb–Douglas type), deserves particular attention [Cichy 2008]. Since the second half of the 1980s, endogenous growth models have appeared, expanding the neo-classical Solow model, where technological progress is endogenised. The most frequently empirically verified endogenous models are models of Lucas [1988] and Romero [1986, 1990]. The starting point in this case is the critical analysis of the Solow model and the thesis that technological progress (understood as the accumulation of scientific and technical knowledge or human capital) is a result of purposeful investment decisions of entities in the above-mentioned spheres. In turn, the rejection of the thesis about constant effects of the scale of the production function results from the fact that the accumulation of scientific and technical knowledge and human capital leads to externalities as a consequence of the fact that accumulated knowledge and human capital can be used not only by entities directly incurring the costs of this accumulation, but also by their micro and/or macroeconomic environment [Liberda 1996]. The main thesis arising from the theory of endogenous growth is the statement that due to the existence of externalities associated with technological progress, it is possible to increase the long-term rate of economic growth in an effective and sustainable manner [Tokarski 2001].

As shown in the presented theories, inventions are necessary to create and maintain competitiveness, and gaining an advantage based on innovations has become

a necessary prerequisite for competitiveness. This is, firstly, due to the fact that because of modern production technologies, it is possible to achieve greater efficiency, and secondly, due to the fact that more modern products increase consumer choice possibilities, which potentially increases their utility. The presented new growth models show that technological progress is an important factor of economic growth, and it is a result of rational investing in research and education.

Competition and competitiveness

Economic entities must adapt to changes taking place in their environment, which requires the implementation of innovations and being innovative. Innovations and innovativeness of enterprises are factors that improve the efficiency of management and bring economic benefits to enterprises, industries, national economies and societies. An expression of benefits derived from implemented innovations is competitiveness. Overall, competitiveness is the ability to compete, which in reality means the ability to increase the company's market share or maintain its current position. Competitiveness may refer to a product, enterprise, industry, technology, and economy.

The relationship between competitiveness and competition is based on the assumption that competitiveness cannot be achieved in isolation from competition. The stronger the competition, the greater the chance of improving competitiveness, otherwise the company is at risk of withdrawal from a given production or market [Ziemiński and Żukrowska 2004]. On the one hand, competition is a widely known, understandable category, and on the other hand, it is ambiguous and difficult to define.

Changes taking place in economic, social and political life alter the way of perceiving the essence of competition, its premises and mechanisms of market rivalry. The definition formulated in the year 2000 is an expression of changes occurring in the perception of the phenomenon of competition: "Competition consists of the constant struggle among firms for a comparative advantage in resources that will yield a marketplace position of competitive advantage and, thereby, superior financial performance." The resource-based theory of competitive advantage takes into consideration that competition is disequilibrium provoking, and assumes

that innovations, learning and acquiring organisational knowledge are endogenous [Hunt 2000].

DATA AND RESEARCH METHODOLOGY

Manufacturing in Poland

The study focuses on the quantitative assessment of the relationships between expenditure on innovative activity and sold production or gross value added in manufacturing enterprises (Section C) at the two-digit level of aggregation, i.e. at the level of divisions in this section. This level of aggregation of information was considered sufficiently detailed and appropriate to assess the above-mentioned relationships. Published statistical data of the Central Statistical Office of Poland (GUS) on the amount of particular types of expenditure by individual divisions of manufacturing (section C of the Polish Classification of Activities – PKD) in the years 2009–2016 were used. The collected statistical data have the structure of the panel in which the basic period is the calendar year, while the objects are divisions of manufacturing.

The selection of manufacturing enterprises for analysis was based on the relatively high importance of manufacturing in the Polish economy. The role and importance of manufacturing in the Polish economy (2016) are evidenced, among others, by its participation in the creation of gross domestic product (23.5%), in investment expenditure (38.4%), and in the gross value of fixed assets (32.5%). In addition, more than one fifth of the Polish workforce is employed in the Polish manufacturing industry (20.8%) [GUS 2017]. A special feature of manufacturing, in addition to its dominant position in exports, is also its significant role in the economy's innovativeness. Manufacturing is of key importance for the development of company expenditures on research and development. In most of the EU countries, expenditure on R&D incurred in manufacturing accounts for more than 50% of total expenditure, and often even more than 70%, as in the case of Sweden and the Netherlands, or more than 80% as in the case of Germany.

The analysis of the information presented in Figure 1 indicates that the sold production, gross value added, investment expenditure and gross value of fixed assets in the analysed period were characterised by a clear up-

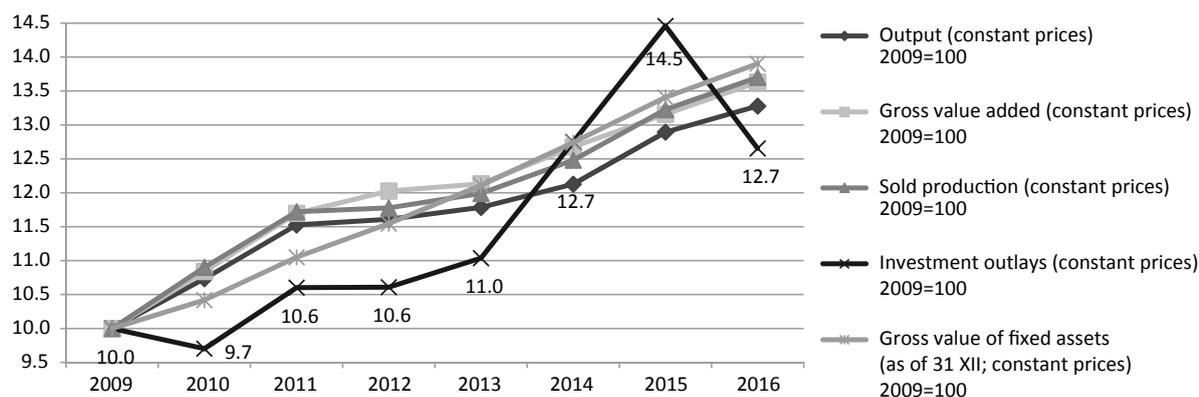


Fig. 1. The dynamics of selected indices describing the development of manufacturing in Poland in the years 2009–2016
Source: Own elaboration based on GUS [2017].

ward trend. The positive growth rate of these indices confirms that in Poland manufacturing is developing, maintaining an important position in the economy.

DYNAMIC PANEL DATA MODELS

In studies on the economic performance of enterprises, attention is paid to a certain degree of their sustainability – the results obtained in the past determine the current state. The dynamic nature of the studied phenomena combined with the panel nature of the data necessitates the use of dynamic panel data models.

In general, a dynamic panel data model can be expressed as follows:

$$y_{it} = \gamma y_{i,t-1} + \mathbf{x}_{it}^T \boldsymbol{\beta} + u_{it} = \gamma y_{i,t-1} + \mathbf{x}_{it}^T \boldsymbol{\beta} + \alpha_i + \varepsilon_{it}, \quad (1)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

where:

$\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$ for each i, t ;

α_i – group effects; if α_i are random, then $\alpha_i \sim N(0, \sigma_\alpha^2)$;

$\mathbf{x}_{it} = [x_{kit}]_{K \times 1}$ – vector of explanatory variables with K coordinates;

$\boldsymbol{\beta}$ – vector of parameters ($K \times 1$), identical for each i and t [Maddala 2006, Dańska-Borsiak 2011];

γ – autoregressive coefficient.

The most important proposals for the estimation of dynamic panel data models presented in the contemporary literature are based on the generalised method of moments (GMM) and the instrumental variables meth-

od resulting from it [Baltagi 2003]. This method makes it possible to simultaneously take into account heteroscedasticity and autocorrelation of a random component as well as to distinguish and apply appropriate instrumental variables. The generalised method of moments is particularly useful for estimating models that contain endogenous or predetermined explanatory variables, and when the process that generates time series is not fully specifiable [Dańska-Borsiak 2011]. It is assumed that one can have instrumental variables Z which are independent of the random components of the model.

The estimator of the generalised method of moments has the following form:

$$\begin{bmatrix} \hat{\gamma} \\ \hat{\boldsymbol{\beta}} \end{bmatrix} = (\mathbf{X}^T \mathbf{Z} \mathbf{W}_N \mathbf{Z}^T \mathbf{X})^{-1} (\mathbf{X}^T \mathbf{Z} \mathbf{W}_N \mathbf{Z}^T \mathbf{y}) \quad (2)$$

where:

$\mathbf{Z} = (Z_1, Z_2, \dots, Z_N)$ – properly constructed matrix of instruments;

\mathbf{W}_N – weight matrix.

This class of models requires the use of specific estimation methods, other than the methods used for static models. The most important proposals of such methods, presented in the contemporary literature, are based on the generalised method of moments. Among a number of methods proposed for the estimation of dynamic panel data models, in practice the greatest role is played by two such methods: the GMM for the model in the form of first differences (FDGMM) and the system estimator GMM (GMM-SYS) which is its

expansion. Each of the estimators can be considered as a one- or two-step estimator. Instrument matrix \mathbf{Z} and weight matrix \mathbf{W}_N determine the form of the estimator. In the correctness analysis of the estimated GMM model, particular attention is paid to two tests: the Arellano–Bond autocorrelation test and the Sargan test of over-identifying restrictions.

In the first-difference model (model FDGMM), the occurrence of the autocorrelation of random component ε_{it} is an expected phenomenon¹. The presence of higher-order autocorrelation would mean that the instruments used in the GMM estimation process are not appropriate. Therefore, the test which verifies the correctness of the moment conditions can be a test examining the occurrence of the second-order autocorrelation in model (1). Arellano and Bond (1991) proposed a second-order autocorrelation test in which the null hypothesis assumes a lack of such autocorrelation. The empirical statistic of the Arellano–Bond test has the following form:

$$AR(2) = \frac{\Delta \hat{\boldsymbol{\varepsilon}}_{-2}^T \Delta \hat{\boldsymbol{\varepsilon}}_*}{\Delta \hat{\boldsymbol{\varepsilon}}^{1/2}} \quad (3)$$

where:

$\Delta \hat{\boldsymbol{\varepsilon}}_{-2}$ – the second differences of vector $\Delta \boldsymbol{\varepsilon}$, and the elements of vector $\Delta \hat{\boldsymbol{\varepsilon}}_*$ are equal to the elements of $\Delta \boldsymbol{\varepsilon}$, omitting the first two values (to make the multiplication feasible);

$AR(2)$ – statistic has a normal distribution $N(0, 1)$.

Another important test is the Sargan test used to test the correctness of over-identifying restrictions not used in the estimation process. According to the null hypothesis, the instruments used are appropriate in the sense of a lack of their correlation with the random components of the first-difference model. The empirical statistic has the following form:

$$s = \Delta \hat{\boldsymbol{\varepsilon}}^T \mathbf{Z} \left[\sum_{i=1}^N \mathbf{Z}_i^T \Delta \hat{\boldsymbol{\varepsilon}} \Delta \hat{\boldsymbol{\varepsilon}}^T \mathbf{Z}_i \right]^{-1} \mathbf{Z}^T \Delta \hat{\boldsymbol{\varepsilon}} \quad (4)$$

Statistic s has a distribution of χ^2 with q degrees of freedom, where q is the number of columns of matrix \mathbf{Z} less the number of estimated parameters [Dańska-Borsiak 2011].

RESULTS

An attempt to quantify the impact of expenditure on innovations on the economic performance of enterprises in divisions of manufacturing was made for two selected variables characterising the economic performance of manufacturing enterprises: sold production and gross value added.

The starting point of the analysis of the impact of innovation expenditure on sold production was a two-factor function of production extended by another factor – expenditure on innovations. Finally, the sold production model of manufacturing divisions took the following form:

$$\ln(SP)_{it} = \beta_0 + \gamma \ln(SP)_{i,t-1} + \beta_1 \ln(Empl)_{it} + \beta_2 \ln(Ninv)_{it} + \beta_3 \ln(Innov)_{it} + \varepsilon_{it} \quad (5)$$

where:

$\ln(SP)_{it}$ – natural logarithm of the value of sold production in PLN million at constant prices from 2009 (the price index of sold production in manufacturing was used for data adjustment) for the i -th manufacturing division in the time period t ; the other designations are the same as in the value added model;

$\ln(Empl)_{it}$ – natural logarithm of the average employment in thousands of people for the i -th manufacturing division in the year t ;

$\ln(Ninv)_{it}$ – natural logarithm of investment expenditure at constant prices in PLN million from 2009 (the CSO index of investment prices was used for data adjustment);

$\ln(Innov)_{it}$ – the natural logarithm of expenditure on innovative activity in the field of product and process innovations in manufacturing at constant prices in PLN million from 2009 (the CSO GDP price index was used for data adjustment).

The data used cover the period 2009–2016 for 24 divisions of manufacturing in Poland.

Similarly as in the case of sold production, the starting point for gross value added analyses was the Cobb–Douglas production function, including the ad-

¹ If ε_{it} are independent, their first differences are correlated to the order of 1 [cf. Dańska-Borsiak 2010].

ditional factor in the form of current expenditure on innovations. Bearing this in mind, the following value-added model was used in the study:

$$\ln(GVA)_{it} = \beta_0 + \gamma \ln(GVA)_{i,t-1} + \beta_1 \ln(Empl)_{it} + \beta_2 \ln(Ninv)_{it} + \beta_3 \ln(Innov)_{it} + \varepsilon_{it} \quad (6)$$

where:

$\ln(GVA)_{it}$ – natural logarithm of gross value added at constant prices in PLN million from 2009 (the CSO GDP price index was used for data adjustment) for the i -th manufacturing division in the year t ;

The other designations are the same as in the sold production model.

Due to the higher statistical value, measured by the results of the Arellano–Bond and Sargan tests for the GMM-SYS method, the estimations obtained with the use of this method were presented.

The results are summarised in Table 1. The absolute values of the Student t -statistics are quoted in brackets, the last three lines contain respectively: $AR(2)$ – the empirical values of Arellano–Bond statistic which verify the occurrence of autocorrelation of the first- or

second-order random component in the first-difference model; H_0 : the autocorrelation of the first (second)-order does not occur, the Sargan s -statistics – the empirical values of Sargan statistic verifying the correctness of over-identifying restrictions; H_0 : instruments are appropriate, N – number of observations.

A positive and statistically significant estimate of the autoregressive coefficient in both the sold production model and the gross value added model shows the dependence of the analysed categories on the economic performance in previous periods. This confirms the validity of the use of dynamic panel models. The results of statistical tests indicate the correctness of the instruments used in both models. The values of Sargan test statistics do not give rise to rejecting the H_0 hypothesis at the significance level of 0.05, which allows for the recognition of the over-identifying restrictions as correct. The Arellano–Bond autocorrelation test indicates no grounds for rejecting the null hypothesis, which means that there is no second-order autocorrelation.

The estimation of the autoregressive coefficient in both the sold production model and the gross value added model is statistically significant and positive. Its higher value in the case of the sold production model

Table 1. Results of estimation of parameters of dynamic panel data models of sold production and gross value added in manufacturing

Explanatory variables and selected characteristics	Parameter estimate	z	p	Parameter estimate	z	p
	sold production model: $\ln(SP)_{it}$			gross value added model: $\ln(GVA)_{it}$		
$\ln(SP)_{i,t-1}$	0.7510	33.8910	0.0000	–	–	–
$\ln(GVA)_{i,t-1}$	–	–	–	0.5827	80.2720	0.0000
$\ln(Ninv)_{it}$	0.0850	13.2380	0.0000	0.1858	20.7844	0.0001
$\ln(Empl)_{it}$	0.1551	9.3291	0.0000	0.0970	24.5348	0.0001
$\ln(Innov)_{it}$	0.0443	9.9016	0.0001	0.0474	9.8977	0.0001
Constant	1.0465	8.4855	0.0001	1.7831	20.8361	0.0001
Sargan test [p]	20.0887	–	[0.7873]	22.4666	–	[0.6629]
$AR(2)$ test [p]	[-0.1983]	–	[0.8428]	[-0.7007]	–	[0.4834]
N	168	–	–	168	–	–

p – probability value ($p \in [0, 1]$).

Source: Own calculations.

than in the case of gross value added indicates a higher degree of sustainability of sold production.

The results of the conducted research confirm the impact of basic production factors on sold production in manufacturing. The size of employment and investment expenditure are positively and significantly correlated in statistical terms with the value of sold production. The impact of expenditure on process and product innovations in the analysed manufacturing divisions on their production expressed in terms of value was also statistically significant. An 1% increase in current expenditure on product and process innovations results in a 0.044% increase in sold production.

When assessing the impact of basic production factors on the value added in manufacturing, a significant relationship, consistent with expectations, between the variables under study was confirmed. Both employment and investments have a positive impact on the value added in manufacturing. The expenditure on product and process innovations, which constituted the main subject of the conducted analyses, is important for the creation of the gross value added of manufacturing enterprises. An 1% increase in the current expenditure on innovations contributes on average to a 0.047% increase of gross value added.

CONCLUSIONS

Taking into account dynamically changing environmental conditions, innovativeness should be one of the most important engines of the economy, while on the micro- and meso-economic scale, it should determine the competitiveness of enterprises and industry sectors. The analyses carried out with the use of dynamic panel data models for the years 2009–2016 confirm a positive impact of expenditure on innovative activity in the field of product and process innovations on selected results of economic performance in divisions of manufacturing understood alternatively as sold production and gross value added. The applied function form of the models enables the interpretation of parameter estimates in terms of elasticity of the considered economic results with respect to expenditure on innovative activity. The impact of the analysed expenditure on innovations expressed by the model parameter estimate is slightly higher in the case of gross value added. Atten-

tion should be paid to the low values of estimates of parameters at the variable describing innovations, which suggests that in the context of other factors (especially technical equipment) innovativeness is a secondary factor of change in Polish enterprises.

The presented assessment of the relationship between innovations and competitiveness (sold production and gross value added) in manufacturing enterprises does not exhaust the complexity of the issue, and constitutes only one of the threads that make up the whole assessment system. The issues considered are particularly important in the context of the Polish economy, which is facing difficult development-related challenges. In Poland, the existing sources of competitiveness such as relatively low labour costs and costs of other production factors are being exhausted. Therefore, new factors of modernisation and competitive advantages of manufacturing enterprises based on knowledge, innovations and human capital should be sought. An important source of competitiveness should be quality and uniqueness of products, the ability to identify and satisfy individual customer needs, comprehensive promotional activities, and creating a company image based on trust in the quality of its products.

The research conducted and conclusions formulated are a contribution that should prompt further research in this area.

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OCENA ZWIĄZKÓW MIĘDZY INNOWACJAMI A WYNIKAMI EKONOMICZNYMI PRZEDSIĘBIORSTW PRZETWÓRSTWA PRZEMYSŁOWEGO W POLSCE

STRESZCZENIE

Wzrost gospodarczy, jak wynika z badań, opiera się w długim okresie na innowacjach, a te z kolei zależą m.in. od inwestycji w działalność badawczo-rozwojową (B+R). Celem artykułu jest pomiar i ocena wpływu innowacji na konkurencyjność przedsiębiorstw z działów przetwórstwa przemysłowego. Jako mierniki konkurencyjności przyjęto – w zależności od wersji modelu – produkcję sprzedaną lub wartość dodaną brutto. Badanie opiera się na analizie funkcji produkcji Cobba–Douglasa poszerzonej o zmienną opisującą innowacje (nakłady na działalność innowacyjną). Postępowanie badawcze zostało zrealizowane dla okresu 2009–2016 i stanowi przyczynek do określenia roli innowacji w kształtowaniu wyników ekonomicznych przedsiębiorstw. Podstawą zbioru zmiennych wejściowych są dane statystyczne publikowane przez Główny Urząd Statystyczny. Dodatnia i istotna statystycznie ocena współczynnika autoregresyjnego zarówno w modelu produkcji sprzedanej, jak i w modelu wartości dodanej brutto wskazuje na zależność analizowanych kategorii od wyników osiągniętych w okresach wcześniejszych. Zasadność zastosowania dynamicznych modeli panelowych została potwierdzona empirycznie.

Słowa kluczowe: innowacyjność, modele panelowe, funkcja Cobba–Douglasa, działy przetwórstwa przemysłowego

THE REGIONAL DIFFERENTIATION OF KNOWLEDGE POTENTIAL IN POLAND IN THE CONTEXT OF BUILDING A KNOWLEDGE-BASED ECONOMY

Wioletta Wierzbicka  

University of Warmia and Mazury in Olsztyn

ABSTRACT

The aim of this study was to evaluate the regional differentiation of knowledge potential in Poland and changes which have occurred in this field between 2009 and 2015. The study was based on numerical taxonomy methods, including the linear ordering method. It was concluded that the regional differentiation in knowledge potential in Poland is at a moderate level, and the scale of this differentiation has decreased. This finding has been confirmed by the value of the variability coefficient, which decreased from 22% in 2009 to 17.5% in 2015. The highest level of knowledge potential was identified in Mazowieckie Province. The lowest level of knowledge potential was noted in Lubuskie, Świętokrzyskie and Warmińsko-Mazurskie Provinces.

Key words: knowledge potential, synthetic knowledge index, regional differentiation

INTRODUCTION

The contemporary economy is referred to as the knowledge-based economy (KBE). Its most important resource and a development stimulant is knowledge, and the ability to create, absorb and implement knowledge. The KBE development is stimulated by high quality human capital, which is ‘a carrier’ of knowledge and innovation, and modern information and communication technologies, which enable the dissemination and processing of information and knowledge. An important role in the growth of the knowledge-based economy is played by research and development activities as well as the quality of an institutional environment.

Using terminology adopted by the World Bank, it can be presumed that the contemporary economy rests on four pillars: an educated and qualified population, effective innovation systems, modern and adequate in-

formation infrastructure, and a system of economic and institutional incentives. The cohesive development of these areas are fundamental to the process of creating a knowledge-based economy in a given country. The regional dimension of the KBE formation is extremely important. The creation of KBE in a country is based on regions possessing high potential and the ability to develop each of the KBE pillars.

The aim of this study was to evaluate the regional differentiation of knowledge potential in Poland, and the changes which have occurred in this field between 2009 and 2015. The following research hypothesis was formulated: “The regional differentiation of knowledge potential in Poland is at a moderate level and the scale of this differentiation is decreasing”.

The study was conducted on the NUTS II level. Taxonomy methods were applied, including a linear ordering method based on a synthetic variable and a method of clustering linearly ordered objects.

THE CONCEPT OF A KNOWLEDGE-BASED ECONOMY

The 1990s witnessed a growing interest in knowledge and its influence on economic processes. Knowledge was considered to be the most essential resource – more important than land, capital or labour [Drucker 1998, Dunning 2000]. To highlight this new paradigm of growth, driven by knowledge and innovation, the concept of a knowledge-based economy was introduced to economic sciences [Kukliński 2001, 2007].

The notion of a knowledge-based economy is not defined unequivocally. Different authors underline different aspects of this phenomenon. One group of definitions emphasises the role of knowledge in the development of this type of economy. In this approach, the knowledge-based economy is defined as an economy which directly depends on the production, distribution and implementation of knowledge and information [OECD 1996], as an economy in which knowledge is efficiently created, absorbed, transferred and implemented by enterprises, organisations, physical persons and communities, stimulating a rapid growth of the economy and society [Dahlman and Andersson 2000]. It is an economy which uses knowledge as its main motor of economic growth [Gorji and Alipourian 2011], or it is an economy in which there are many enterprises that build their competitive advantage on knowledge [Kozłowski 2001].

Another group of definitions underlines the role of innovation in the development of the KBE. Gorzelak and Olechnicka [2003] point to the fact that the essence of the knowledge-based economy is the high intensity of using in practice new elements of knowledge, such as innovations. Piech [2007] defines the KBE as an economic system powered by innovations, which by influencing all branches of the economy accelerates the increase in productivity and the rate of economic

growth. Czyż [2009] underlines that the base for this type of economy is composed of R&D activities and innovations, which lead to the modernisation of the economy and improved productivity.

The third group of definitions places an emphasis on the role of information and communication technologies (ICT) in the development of the KBE. Żelazny [2006] points to the fact that in the knowledge-based economy there is a process of dynamic development driven by information and telecommunication technologies as well as knowledge resources, which are mutually dependent. Al-Busaidi [2014] stressed that the base of the knowledge economy and a necessary condition for its development consists of ICT, which significantly support the development of the other pillars of knowledge. Bashir [2013] defines the KBE as an economy characterised by the high and growing intensity of the implementation of ICT by well-educated employees. In fact, individual definitions of the knowledge-based economy highlight its different pillars, which have been described in the knowledge assessment methodology (KAM), developed by the World Bank in 1998. The said pillars are [Chen and Dahlman 2006, Ujwary-Gil 2013, World Bank 2016]:

1. Economic incentive and institutional regime¹, which encourages effective entrepreneurship, enables efficient allocation of resources and motivates for effective creation, dissemination and implementation of knowledge; the variables which describe this pillar refer to legal regulations in a given country, the quality of these regulations and barriers used in trade policy.
2. Educated and skilled workers², who can constantly develop and adjust their skills for the sake of efficient creation and implementation of knowledge; the variables used to describe this pillar include: high adult literacy rate, enrolment to secondary

¹ In the literature this pillar is also known as the system of economic incentives [cf. Strożek 2012], institutional and regulatory regime [cf. Nowak 2013]. Importantly, the use of different terminology with respect to a given KBE pillar is often connected with the adopted methodology of research and selection of variables describing a given KBE pillar.

² This pillar is also called the human capital pillar, but then it is equated with its narrow sense, where it is understood as the level of education of the society in economy [Florczak 2008, Niklewicz-Pijaczyńska and Wachowska 2012], as education capital in the quantitative sense [Soszyńska 2013]. In a broad approach, human capital corresponds to the resources of knowledge, skills, competences, health and even vital energy of a society [Przybyszewski 2007, Peters 2013].

and higher education schools, net enrolment rate, share of allocated resources to education in GDP, number of higher education students in an entire population.

3. Effective innovation system³ comprising enterprises, research centres, universities and other organisations, which are able to draw on the growing resources of global knowledge, assimilate it and adjust it to local needs; the innovation indicators include: number of employees in the R&D sector, inputs in R&D as % of GDP, number of scientific publications, number of patents.
4. Modern and adequate information infrastructure, which facilitates effective communication, dissemination and processing of information and knowledge; the level of this infrastructure is measured, i.a., by the number of telephones, computers and Internet users per 1,000 persons, the level of expenditure on ICT expressed in % of GDP, and the accessibility to e-administration.

The knowledge assessment methodology is constantly improved and currently is based on 148 variables⁴, which represent the four pillars of KBE. Within the KAM methodology, two simplified indices have also been determined [Chen and Dahlman 2006, Wasiaś 2008, Bashir 2013]:

- knowledge index (KI) – composed of nine variables, three for each of the three pillars (except the system of economic and institutional incentives);
- knowledge economy index (KEI) – composed of 14 variables, including three for each of the four pillars and two variables describing the economic condition of the country.

The knowledge index is a measure that determines the creation, use and diffusion of knowledge, which is the knowledge potential in a given economy. The knowledge economy index, in turn, serves to make economic comparisons on international and temporal scales [Tocan 2012, Nowak 2013].

RESEARCH METHODOLOGY

The synthetic index was used to assess the potential of knowledge in the regions. The index was built in accordance with the construction of the KI, but some modifications were introduced⁵. The selection of variables was based on formal and substantial criteria, which led to the choice of 36 variables. Statistical aspects were also taken into consideration, i.e. the variability of the variables and their degree of correlation with other variables. Eventually, 25 variables were included in the set of variables to describe the knowledge potential in regions, and these were divided between three KBE pillars:

1. Human capital:

- X_1 – net enrolment rate in lower-secondary vocational schools,
- X_2 – net enrolment rate in secondary comprehensive schools,
- X_3 – number of students in higher education schools per 10,000 of the population,
- X_4 – number of higher education schools per 1 million of the population,
- X_5 – number of students in post-university studies per 10,000 of the population,
- X_6 – number of PhD students per 10,000 of the population,
- X_7 – number of children and adolescents doing compulsory English language learning in primary, secondary and post-secondary schools per 1,000 of the population,
- X_8 – percentage of the population aged 15–64 years with higher education,
- X_9 – percentage of adults aged 25–64 years participating in education or training,
- X_{10} – expenditure on education and upbringing expressed as % of GDP.

³ This pillar is also called the efficient system of innovations [cf. Strożek 2012] or system of innovations [cf. Nowak 2013].

⁴ Such a large number of variables means that among the disadvantages of the KAM method researchers mention the doubling of many data due to the inclusion of strongly correlated variables.

⁵ In the literature, many studies can be found in which the methodology of KAM is modified [cf.: Chojnicki and Czyż 2003, Kukliński and Burzyński 2004, Piech 2006, Strahl 2009, Dworak et al. 2014].

2. Innovation system:

- X_{11} – number of units where R&D activities are undertaken per 10,000 national economy business units listed in the REGON register,
- X_{12} – level of internal inputs into R&D per capita,
- X_{13} – number of persons employed in the R&D sector in full time equivalents (FTE) per 1,000 occupationally active persons,
- X_{14} – percentage of industrial enterprises which have made inputs into innovation,
- X_{15} – share of net revenue from sale of innovative products in industrial enterprises, in the net revenues from total sale,
- X_{16} – patents granted by the patent Office of the Polish Republic, per 1 million of the population,
- X_{17} – share of human resources dedicated to science and technology among the occupationally active population,
- X_{18} – percentage of students doing technical or natural science studies.

3. Information and communication technology (ICT):

- X_{19} – percentage of households having personal computers with access to the Internet,
- X_{20} – percentage of households having mobile telephones,
- X_{21} – percentage of households having devices for receiving satellite or cable television programmes,
- X_{22} – percentage of enterprises⁶ using computers,
- X_{23} – percentage of enterprises⁶ having access to the Internet,
- X_{24} – percentage of enterprises⁶ having own webpage,
- X_{25} – percentage of enterprises⁶ using the Internet in contacts with public administration.

A synthetic measure was determined for each KBE pillar. Appropriate variables were turned into a synthetic index using non-formula methods, which consist of an operation of averaging values of normalised variables. Normalisation of variables was accomplished through the procedure of zeroed unitarisation. In order to ensure the comparability of Polish provinces between the years, the variables expressed in monetary units were given in constant prices of 2015, and all variables were treated as panel data. Due to the fact that all variables were ascribed the character of a stimulant⁷, the procedure of unitarisation was conducted according to the following formula [Panek and Zwierzchowski 2013]:

$$z_{ij} = \frac{x_{ij} - \min_i \{x_{ij}\}}{\max_i \{x_{ij}\} - \min_i \{x_{ij}\}} \quad (1)$$

where:

z_{ij} – normalised value of j -th variable in i -th object;
 x_{ij} – value of j -th variable in i -th object;
 $\min_i \{x_{ij}\}, \max_i \{x_{ij}\}$ – min and max values of j -th variable in the set of objects.

Normalised variables were submitted to the synthesis procedure, according to the following aggregation formula [Panek and Zwierzchowski 2013]:

$$s_i = \frac{1}{m} \sum_{j=1}^m z_{ij} \quad i = 1, 2, \dots, n \quad (2)$$

where:

s_i – value of the synthetic variable in i -th object;
 z_{ij} – normalised value of j -th variable in i -th object;
 m – number of variables.

Based on values of the synthetic variables determined for the individual KBE pillars, a synthetic knowledge index, which determines the general knowledge potential in the Polish provinces, was computed. This index was calculated as an arithmetic mean of the partial indices determined for the three KBE pillars.

⁶ This concerns enterprises of the non-financial sector.

⁷ The character of variables was identified on the basis of content-related indications. The presumed character of variables was verified ex post, by testing the correlation of individual variables with the synthetic variable.

REGIONAL DIFFERENTIATION OF KNOWLEDGE POTENTIAL IN POLAND

The value of the synthetic knowledge index for the total of Polish provinces increased over the analysed time period by over 40%. The dynamics of the growth of the synthetic knowledge index in particular provinces was varied (Table 1).

The highest dynamics occurred in the Lubuskie Province – 1.79 and Podlaskie Province – 1.62, while the lowest dynamics appeared in the Pomor-

skie and Zachodniopomorskie Provinces – at 1.29 for both.

Importantly, during the entire time period analysed, the regional differentiation of knowledge potential in Poland remained at a moderate level⁸, and the scale of differences, comparing the years 2009 and 2015, diminished slightly. This can be confirmed by the value of the variability coefficient, which decreased from 22% in 2009 to 17.5% in 2015. In addition, this conclusion can be supported by the fact that the ratio of the lowest synthetic value of the knowledge index to

Table 1. Synthetic knowledge index in Polish provinces in the years 2009–2015

Province	Value of the synthetic knowledge index							Dynamics of changes 2009–2015
	2009	2010	2011	2012	2013	2014	2015	
Dolnośląskie	0.395	0.475	0.495	0.533	0.522	0.587	0.603	1.52
Kujawsko-Pomorskie	0.323	0.442	0.425	0.435	0.390	0.409	0.445	1.38
Lubelskie	0.317	0.405	0.460	0.470	0.484	0.491	0.488	1.54
Lubuskie	0.222	0.350	0.338	0.344	0.373	0.387	0.396	1.79
Łódzkie	0.311	0.412	0.395	0.432	0.436	0.442	0.465	1.50
Małopolskie	0.408	0.518	0.517	0.514	0.525	0.556	0.575	1.41
Mazowieckie	0.557	0.635	0.634	0.666	0.690	0.722	0.739	1.33
Opolskie	0.334	0.402	0.394	0.434	0.411	0.437	0.448	1.34
Podkarpackie	0.341	0.422	0.408	0.399	0.434	0.481	0.504	1.48
Podlaskie	0.267	0.382	0.393	0.424	0.405	0.398	0.433	1.62
Pomorskie	0.483	0.570	0.547	0.555	0.550	0.602	0.622	1.29
Śląskie	0.397	0.483	0.472	0.507	0.500	0.519	0.519	1.31
Świętokrzyskie	0.251	0.331	0.291	0.353	0.349	0.368	0.399	1.59
Warmińsko-Mazurskie	0.259	0.379	0.347	0.329	0.352	0.368	0.382	1.48
Wielkopolskie	0.361	0.450	0.453	0.457	0.485	0.505	0.516	1.43
Zachodniopomorskie	0.320	0.425	0.402	0.398	0.387	0.399	0.414	1.29
	Variability coefficient (%)							
×	22.0	16.3	17.7	17.4	17.6	18.4	17.5	×

Source: Own calculations, based on data from the Local Data Bank of the Polish Central Statistical Office and from Eurostat.

⁸ It was assumed that a value of the variability coefficient below 10% means insignificant variability, within the interval <10%; 40%> – moderate variability, and over 40% – high variability of the characteristic.

its highest value in a given year declined from 2.51 in 2009 to 1.93 in 2015.

As a result of the differentiated level of the synthetic knowledge index at the onset of the analysed time period and the varied dynamics of its growth over the same period, the situation of particular provinces relative to the others changed significantly. This can be confirmed by ranking lists made according to the synthetic knowledge index values and the results of the clustering of provinces supported by the standard deviation method (Table 2). In line with the assumptions of this method, the set of analysed objects was divided into four groups, and the borderlines between the intervals were set up based on the values of an arithmetic mean of the synthetic knowledge index for

the total of provinces (\bar{s}) and the level of standard deviation of this index $S(s)$ in the analysed year [Panek and Zwierzchowski 2013].

The unquestionable leader with respect to knowledge potential is the Mazowieckie Province, which occupied the first place over the entire analysed time period. The value of the synthetic knowledge index in this province at the beginning of the study was at such a high level that most of the other provinces were unable to reach it even six years later. In fact, only three provinces managed to achieve it, and these were the Dolnośląskie and Pomorskie Provinces in 2014, and the Małopolskie Province in 2015. An asset of the Mazowieckie Province is its very high potential of knowledge in all of the three KBE pillars. This province is

Table 2. Results of the linear ordering and clustering of the provinces with respect to knowledge potential in 2009 and in 2015

2009			2015		
Ranking position	Province	knowledge potential	Ranking position	Province	knowledge potential
1	Mazowieckie	very high	1	Mazowieckie	very high
2	Pomorskie	$s_i \geq \bar{s} + S(s)$ $s_i = 0.434$	2	Pomorskie	$s_i \geq \bar{s} + S(s)$ $s_i \geq 0.594$
3	Małopolskie		3	Dolnośląskie	
4	Śląskie	high	4	Małopolskie	
5	Dolnośląskie	$\bar{s} + S(s) > s_i \geq \bar{s}$ $0.434 > s_i \geq 0.347$	5	Śląskie	high
6	Wielkopolskie		6	Wielkopolskie	$\bar{s} + S(s) > s_i \geq \bar{s}$ $0.594 > s_i \geq 0.497$
7	Podkarpackie		7	Podkarpackie	
8	Opolskie		8	Lubelskie	
9	Kujawsko-Pomorskie		9	Łódzkie	
10	Zachodniopomorskie	low	10	Opolskie	low
11	Lubelskie	$\bar{s} > s_i \geq \bar{s} - S(s)$ $0.347 > s_i \geq 0.260$	11	Kujawsko-Pomorskie	$\bar{s} > s_i \geq \bar{s} - S(s)$ $0.400 > s_i \geq 0.497$
12	Łódzkie		12	Podlaskie	
13	Podlaskie		13	Zachodniopomorskie	
14	Warmińsko-Mazurskie	very low	14	Świętokrzyskie	very low
15	Świętokrzyskie	$s_i < \bar{s} - S(s)$ $s_i < 0.260$	15	Lubuskie	$s_i < \bar{s} - S(s)$ $s_i < 0.400$
16	Lubuskie		16	Warmińsko-Mazurskie	

Source: The author, based on the data included in Table 1.

the Polish leader with respect to the level of human capital and innovation systems; it also occupies the second position in Poland regarding the development of ICT.

The Pomorskie Province occupies the second place in Poland with respect to knowledge potential. This province is Poland's leader in terms of the level of development of ICT. It is characterised by a high potential in the field of human resources. The Dolnośląskie Province scores high in the ranking list. It moved from the 5th place in 2009 to the 3rd place in 2015, and together with the Mazowieckie and Pomorskie Provinces, it was classified as belonging to the group of provinces with a very high knowledge potential. The strength of the Dolnośląskie Province lies in its well-developed information and communication infrastructure and high potential in the field of innovations.

The worst situation with respect to knowledge potential appears in the Lubuskie, Świętokrzyskie and Warmińsko-Mazurskie Provinces. During the entire time period studied, these provinces belonged to the group of provinces with very low knowledge potential. The Lubuskie Province, despite having a relatively good situation in the realm of ICT, occupied the last place in the other two areas of knowledge. The Świętokrzyskie Province is characterised by having a

very low knowledge potential in the innovation system and in ICT. The weakness of the Warmińsko-Mazurskie Province lies in its very low knowledge potential in all of the pillars. Noteworthy, however, is the fact that the situation of all these provinces, compared to the country's average, improved. In 2009, the value of the synthetic knowledge index in the Lubuskie Province was lower than the country's average value by as much as 36%, whereas in 2015 the difference decreased to 20.3%. The analogous results for the Świętokrzyskie Province were 27.7% in 2009 and 19.7% in 2015, while in the Warmińsko-Mazurskie Province the figures were 25.4% in 2009 and 23.1% in 2015.

While analysing the ranking lists of Polish provinces, attention was drawn to the fact that the strength of individual provinces stems from different aspects of knowledge. It is therefore worth analysing which of the KBE pillars is the leading pillar in most provinces, and within which pillar can the highest knowledge potential be observed (the figure).

In 2009, the leading pillar in 10 provinces was human capital, while ICT played this role in the remaining six provinces. Thus, the provinces were characterised by a relatively high level of education of the population, which is a necessary condition for efficient creation, acquisition, dissemination and application of

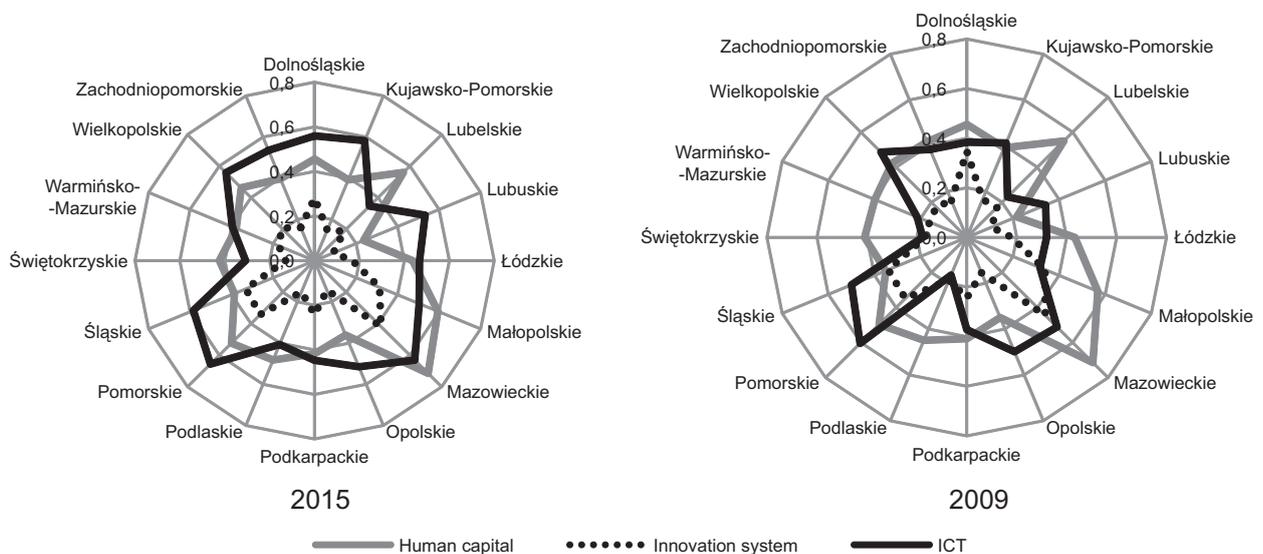


Fig. Knowledge potential in the Polish provinces in individual KBE pillars, in 2009 and 2015
Source: The author, based on data obtained from the Local Data Bank and from Eurostat.

knowledge; as well as a relatively high provision of ICT, which facilitate effective communication, dissemination of knowledge and the processing of information and knowledge. The knowledge potential in the sphere of innovations was relatively low. In the consecutive years, the provinces noted considerable improvement in the area of ICT and innovation systems, which has been confirmed by the values of synthetic indices determined for the particular KBE pillars and the dynamics of their change. Consequently, in 2015, the leading pillar in 15 provinces was the ICT pillar, and in seven provinces the second most important pillar was that of the innovation system. It was only in the Małopolskie Province that the leading pillar was the innovation system.

CONCLUSIONS

The development of a knowledge-based economy in Poland requires coherent regional actions to strengthen its four pillars. The national KBE can be built on well-developed regions with a high potential of knowledge in its particular pillars. This study has evaluated the regional differentiation of knowledge potential in Poland and the changes that have occurred in this context from 2009–2015. In order to assess the potential of knowledge, a synthetic knowledge index was applied, whose construction referred to the KI, developed and used by the World Bank, to measure the potential of knowledge in a given economy.

The results of the analyses can be summarised as follows. During the time period analysed, a greater than 40% increase in the value of the synthetic knowledge index in Poland was recorded, although the dynamics of changes in the values of this index varied highly in the regional approach. The highest growth dynamics were noted in the Lubuskie Province – 1.79 and Podlaskie Province – 1.62, while the lowest growth dynamics were in the Pomorskie and Zachodniopomorskie Provinces – at 1.29 in each. As a consequence of such regionally varied dynamics in the growth of the synthetic knowledge index in Poland and despite significant differences in the level of this index at the beginning of the analysed period of time, the structure of the total assemblage of Polish provinces with respect to knowledge potential became more homo-

geneous. The scale of regional differentiation of the knowledge potential still remains at a moderate level. This is confirmed, for example, by the value of the variability coefficient, which decreased from 22% in 2009 to 17.5% in 2015. The research hypothesis, which presumed that the regional differentiation of the knowledge potential in Poland is at a moderate level and the scale of this differentiation is decreasing, was positively verified.

The leader in knowledge potential in Poland is the Mazowieckie Province. High positions are also occupied by the Pomorskie, Dolnośląskie and Małopolskie Provinces. The lowest knowledge potential was determined in the Lubuskie, Świętokrzyskie and Warmińsko-Mazurskie Provinces. Regardless of the increase in the value of the synthetic knowledge index over the time period analysed, the provinces still have a very low knowledge potential.

The Polish provinces are characterised by a variable level of knowledge potential in the particular KBE pillars. Significantly, an increase in knowledge potential was noted within the information and communication infrastructure. This pillar became the leading one in as many as 15 provinces in 2015. From the point of view of building a knowledge-based economy, this is very important. ICT is the key infrastructure in a knowledge-based economy, and it is a driving force. The widespread use of ICT contributes to an increased efficiency of individual economic entities and creates opportunities for the improvement of the entire economy. Hence, ICT is a very important aspect of building a knowledge-based economy and developing an information society. A considerable increase in knowledge potential was also recorded in the sphere of innovation systems, which means that companies, research centres, universities and other institutions which compose this system are able to use the existing knowledge resources more effectively and transform them into innovations, which is also extremely important in the context of forming a knowledge-based economy.

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REGIONALNE ZRÓŻNICOWANIE POTENCJAŁU WIEDZY W POLSCE W KONTEKŚCIE BUDOWANIA GOSPODARKI OPARTEJ NA WIEDZY

STRESZCZENIE

Celem badań była ocena regionalnego zróżnicowania potencjału wiedzy w Polsce oraz zmian, jakie zaszły w tym zakresie w latach 2009–2015. Badania przeprowadzono przy wykorzystaniu metod taksonomii numerycznej, w tym metody porządkowania liniowego. Na podstawie przeprowadzonych analiz stwierdzono, iż regionalne zróżnicowanie potencjału wiedzy w Polsce kształtuje się na poziomie średnim, a skala tego zróżnicowania się zmniejszyła. Potwierdzeniem tego jest wartość współczynnika zmienności, która obniżyła się z poziomu 22% w 2009 do 17,5% w 2015 roku. Największym potencjałem wiedzy charakteryzuje się województwo mazowieckie, a najmniejszy potencjał wiedzy występuje w województwach lubuskim, świętokrzyskim i warmińsko-mazurskim.

Słowa kluczowe: potencjał wiedzy, syntetyczny wskaźnik wiedzy, regionalne zróżnicowanie

PROMOTION OF REGIONAL FOOD PRODUCTS IN EASTERN POLAND AND WESTERN UKRAINE

Julia Wojciechowska-Solis¹  , Andrzej Soroka²  

¹University of Life Sciences in Lublin

²Siedlce University of Natural Sciences and Humanities

ABSTRACT

This article seeks to describe the attitude of residents of Eastern Poland and Western Ukraine towards regional food products. The objective of the project was to evaluate the elements of promotion, which encourage consumers to buy regional products.

Author's questionnaire was used in the survey of 1,128 residents from Poland, and 1,072 from Ukraine. The Likert five-point scale was used to measure the participant's attitudes following the construction and validation procedure. The Statistica 13.1 PL program was used in statistical analysis.

The most important promotional activities for residents in both countries were: presentation of food products at regional exhibitions, fairs and events of regional and foreign range.

The increased interest in regional food products is a manifestation of new food-related tendencies and in particular to preserve behaviors and values stemming from the cultural heritage of both Poland and Ukraine. It is also connected with high quality of regional products. Appropriate promotion helps consumers see the value of regional products.

Key words: regional products, Eastern Poland, Western Ukraine, regional food

INTRODUCTION

Regional food products constitute an important element of the European food industry, culture, identity and heritage. The uniqueness of regional food in Europe, from an interdisciplinary perspective based on the studies, is a key factor in promoting the competitiveness of the craft food industry, both at local and international level [Kuznesof et al. 1997, Lehtinen 2012]. The need to create heterogeneous cultural and regional food markets is underlined in the economic approach to development of rural areas in Europe. Due to this approach, the European Commission introduced an ambiguous definition of regional food: “the foods involved are identified by, and traceable to a farmer.

The number of intermediaries between farmer and consumer should be minimal or ideally nil” [Niemi and Pekkanen 2016].

Spreading globalization causes that food markets are becoming more and more international. The market share of imported and cheaper consumer goods is increasing. This has an impact on blurring of differences between particular types of food [Byrne et al. 2013]. Without obtaining adequate information, a consumer is not able to distinguish the original product from the mass product [Eriksen 2013].

It is pointed out that appropriate advertising and promotion are the most important media tools in raising public awareness that local food has shorter and more transparent supply chain than conventional food.

This is the main reason for differentiating these two types of food [Arsil et al. 2014, Penney and Prior 2014].

Knight [2013] claims that locality is one of the hottest trends in the food world, and more socially responsible and ethically-minded food consumers look for ecologically and socially sustainable food. Local food is equated with organic and healthy food with original flavor qualities and coming from a known source [Selfa and Qazi 2005, Wojciechowska-Solis and Soroka 2017].

The growing interest in local food has been noticed by the governments of individual countries that support and promote the production of local food. Undoubtedly, such approach has an impact on the development of this food production sector in the above-mentioned countries [Bianchi and Mortimer 2015].

Traditional and regional food products are produced using traditional methods, have designation of regional products, appropriate certificates guaranteeing their authenticity and the EU labels. They are an important part of European culture, identity and heritage [Tregear et al. 2007]. It is a form of cultural and territorial capital that allows obtaining greater social and economic benefits for local rural areas [Kuznesof et al. 1997]. Producers of protected products have the right to mark them with appropriate signs that testify to the quality and uniqueness of the labeled products under the Common Agricultural Policy. Such products may be registered as the Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Specialty Guaranteed (TSG).

Issues related to the protection of regional products and those produced using traditional methods are defined in the European Union law by the European Parliament Regulation, the Commission Delegated Regulation and the Commission Implementing Regulation.

The name of a regional product uses or refers to: a region, a specific place, in exceptional cases to a country where the product is produced. The purpose of the system of protected designations of origin and protected geographical indications is to support producers of products related to a given geographical area through: guaranteeing decent income from the products they produce; ensuring uniform protection of the name as one of the intellectual property rights on the

territory of the European Union; providing consumers with clear information on the additional values of products [Article 4 Regulation (EU) 1151/2012].

Traditional Specialty Guaranteed (TSG) means an agricultural or food product recognized by the European Union due to its specific nature, which means features or sets of characteristics that clearly distinguish the agricultural or food product from similar products belonging to the same category.

The GTS product, unlike the PDO and PGI, does not refer to the specific nature related to geographical origin. The production of such product takes place without a territorial restriction, as in the case of the Protected Designation of Origin and the Protected Geographical Indication, when the conditions of the specification are met [Ministerstwo Rolnictwa i Rozwoju Wsi 2018].

In Poland, the unit responsible for maintaining the registration system of products with specific geographical origin as well as of specific and traditional quality, within the meaning of EU regulations is the Ministry of Agriculture and Rural Development of Poland. At present, the Ministry of Agrarian Policy and Food of Ukraine is carrying out works related to the certification of regional and traditional products. The certification system is to be modeled on solutions used in the European Union – PDO/PGI/TSG for food products [Ministerstvo ahraryoi polityky ta prodovol'stva Ukrayiny 2017].

The aim of this study was to examine opinions of inhabitants of Eastern Poland and Western Ukraine on the promotion of regional food products. The effort was made to indicate the reasons for making purchases as well as determine the sources of information on regional food products. There were evaluated the forms of promotion that are applied as well as the promotional activities that should be undertaken to increase the interest of inhabitants of Eastern Poland and Western Ukraine in regional food products. The criterion used was the division of respondents based on their place of residence and sex. Due to the fact that in Ukraine there are carried out works related to the adaptation of the certification system of regional and local products to the EU models, the introductory part of the questionnaire contained the EU definition of a regional product.

MATERIAL AND METHODS

A diagnostic survey with author's questionnaire was used in the studies. The study was conducted in May and June 2017. After the use of construction and validation procedures, a five-point Likert scale was applied to measure the attitudes. An indicator of scale reliability was calculated where Cronbach's α was 0.87.

In the sample selection procedure a stratified random sampling was applied for each group of respondents, for the inhabitants of Eastern Poland and Western Ukraine. In the next stage, respondents were proportionally divided taking into account their sex and place of residence. Methodological procedures allowed calculating a size of sample, where the level of confidence was set at 0.95, the estimated size fraction at 0.50 and the maximum error at 0.05.

After taking into account the sex and place of residence of the population under survey, a quota selection was used, where respondents were selected on the basis of their availability. In the case of inhabitants of Eastern Poland¹, the research sample was calculated from 3,456,183 of adult inhabitants, whereas in the case of Western Ukraine from 3,134,021 of adult inhabitants². An author's questionnaire was used in the studies to examine 1128 respondents from Eastern Poland that is Podlaskie, Lublin and Subcarpathia regions as well as 1,072 from the territory of Western Ukraine that is Volyn, Lviv and Transcarpathia regions. There were 1,200 respondents surveyed from each country. Some of the questionnaires were rejected due to the lack of reliability and errors. The survey was conducted by telephone (using the CATI technique – computer-assisted telephone interviewing) and included all the criteria applied.

The Statistica 13.1 PL program was used in statistical analysis, and within it discriminant function analysis was applied to determine which variables discriminated the emerging groups. Classification functions were used in the form of calculation of their coefficients which were determined for each group. Prior to the analysis, a multivariate normality was examined,

testing each variable for normality. It was assumed that the matrices of variances were homogenous in groups. Slight deviations were not of a great importance due to the large number of respondents in each group. Statistically, significant were those differences in averages of which probability of randomness was less than $p < 0.05$.

RESULTS

In the opinion of the inhabitants of Eastern Poland the most important source of knowledge about regional food products was information obtained from family or friends. Such opinion, to a significantly higher degree, was declared by women than men. Also in the case of Ukrainian respondents, however with less intensity, but also significantly higher than men, such statement was declared by women.

In the opinion of respondents from Ukraine, television and radio advertisements were the most important sources of the knowledge about regional products. These channels of information obtained the highest value of discriminatory function in the created model. Among Polish respondents, TV advertisements did not appear in the created model, the same as another source of information that is the Internet.

The inhabitants of Western Ukraine also more often sought in the folders and leaflets the proper promotion of regional products. In the case of respondents from Eastern Poland, these values were of definitely lower importance for both women and men.

Respondents from Poland drew knowledge about regional food products from regional events and travels. In the case of respondents from Western Ukraine, this knowledge was at a lower level (Table 1).

High quality of regional products was the main motive for purchasing regional food among respondents from both countries. In Ukraine, men more often than women pointed to this motive, while in Poland by women.

Friends' recommendation on regional products was an important argument for the respondents from

¹ As at 31 June 2017 according to Statistics Poland [Główny Urząd Statystyczny 2018].

² As at 31 July 2017 according to Ukrainian State Statistics Service of Ukraine [Derzhavna sluzhba statystyky Ukrainy 2018].

Table 1. The source of knowledge of respondents from Eastern Poland and Western Ukraine about regional food products

Source of information		Wilks' lambda: 0.686 – Poland Wilks' lambda: 0.614 – Ukraine			Sex	
		Wilks' lambda	F value	p value	women	men
Eastern Poland	from friends/family	0.578	12.218	0.001*	2.463	2.247
	from organized regional events	0.628	8.753	0.003*	1.481	1.386
	from travels	0.632	2.809	0.094	1.475	1.488
	from folders, leaflets	0.587	35.587	0.001*	0.883	1.201
	from the press	0.631	1.132	0.287	1.504	1.558
	Constans				14.778	15.878
Western Ukraine	from friends/family	0.654	42.198	0.001*	1.856	1.344
	from organized regional events	0.621	11.987	0.001*	0.866	1.090
	from travels	0.592	39.159	0.001*	0.576	1.037
	from folders, leaflets	0.626	1.434	0.236	1.797	1.866
	from the Internet	0.602	30.778	0.001*	1.738	2.889
	from TV/radio	0.587	2.787	0.096	2.301	2.196
	Constans				15.238	17.443

*Level of significant difference at $p < 0.050$.

Source: Author's own analysis based on study material.

Eastern Poland, where men significantly more often than women gave such declaration. This motive among respondents from Ukraine did not gain acceptance, thus was not included in the created model.

A motive emphasizing the traditional and natural way of producing regional products did not receive any approval among Polish respondents, while it was very popular among respondents from Ukraine, especially among women. On the other hand, men, to a significantly higher degree than women, paid attention to health benefits of regional products. This argument was underestimated by respondents from Eastern Poland, as it did not appear in the created model.

A motive increasing the significance of original taste and smell of regional food products was not approved by the respondents from Ukraine (Table 2).

Folders and leaflets were the most valued forms of promotion of regional food products by the Ukrain-

ians. Men, to a significantly higher degree than women, paid attention to these forms of promotion. Similar approach was shown by Polish respondents, however with less intensity.

Polish respondents treated fairs and regional events as the most important forms of promotion of regional food products. Such attitude was more often expressed by women than men. Above-mentioned forms of promotion were less often declared by respondents from Ukraine.

TV and radio advertisement reached similar values of the classification function, both among respondents from Poland and Ukraine. However, significant differences occurred between respondents taking into account their sex. In the case of respondents from Poland, significantly higher values of classification function were achieved by women than men, while among Ukrainians these relations were reversed (Table 3).

Table 2. Motives of purchasing regional food products by residents of Eastern Poland and Western Ukraine

Source of information		Wilks' lambda: 0.532 – Poland Wilks' lambda: 0.587 – Ukraine			Sex	
		Wilks' lambda	F value	p value	women	men
Eastern Poland	high product quality	0.589	4.143	0.042*	2.388	2.254
	curiosity, unusual character of the dish	0.521	1.602	0.207	1.448	1.371
	original taste and smell	0.576	11.701	0.001*	1.826	1.617
	friends' recommendation	0.576	9.664	0.001*	2.158	2.333
	constans				15.628	14.419
Western Ukraine	high product quality	0.598	3.709	0.049*	4.400	4.571
	curiosity, unusual character of the dish	0.573	35.877	0.0018	0.931	0.537
	health benefits of the product	0.598	7.496	0.006*	1.967	2.148
	traditional, natural method of production	0.6002	5.637	0.017*	2.422	2.338
	constans				16.322	17.323

*Level of significant difference at $p < 0.050$.

Source: Author's own analysis based on study material.

Table 3. Assessment of the applied forms of promotion of regional food products by residents of Eastern Poland and Western Ukraine

Source of information		Wilks' lambda: 0.603 – Poland Wilks' lambda: 0.532 – Ukraine			Sex	
		Wilks' lambda	F value	p value	women	men
Eastern Poland	TV/radio advertisement	0.603	39.803	0.001*	2.132	1.732
	fairs, regional events	0.639	24.821	0.001*	2.690	2.392
	folders and leaflets	0.609	19.699	0.001*	0.891	1.134
	constans				11.444	10.162
Western Ukraine	TV/radio advertisement	0.532	61.552	0.001*	1.634	2.222
	fairs, regional events	0.587	28.452	0.001*	1.584	1.936
	folders and leaflets	0.587	55.263	0.001*	2.805	3.315
	constans				11.469	12.562

*Level of significant difference at $p < 0.050$.

Source: Author's own analysis based on study material.

Out of seven proposed promotional activities, three of them appeared in the discriminant function model created for Polish respondents, while six in the model created for Ukrainian respondents.

Both surveyed groups declared their participation in cultural events in various regions of the country and abroad, treating this activity as the most important for the promotion of regional products. In the case of re-

spondents from Ukraine, the level of such declarations was similar for women and men, while among Poles women more often expressed such opinion.

Respondents from Western Ukraine sought the biggest opportunities to promote regional food products in publications, local and national press and on popular websites. Women considerably more often than men paid attention to such ways of promotion. These types of promotion were not included in a discriminatory function model created for Polish respondents.

However, promotion that uses the publication of articles on regional products in the press dedicated to health was also highly appreciated by Polish respondents. In the case of respondents from Western Ukraine, this type of promotion was significantly more important for women than men. On the other hand, men

more often than women appreciated the promotion of regional products through radio programs as well as culinary guides sent by email (Table 4).

SUMMARY AND DISCUSSION

The aim of the conducted studies was to obtain opinions of the residents of Eastern Poland and Western Ukraine on the promotion of regional food products. This study demonstrates that regional food is perceived by consumers both regions in a very positive way, and the main motives for acquiring it are high quality and specific taste qualities.

There were defined sources of knowledge about regional products. It turned out that family and friends were the most popular and the best source of

Table 4. Promotional activities having the greatest impact on the promotion of regional food products in the opinion of residents of Eastern Poland and Western Ukraine

Type of promotional activities		Wilks' lambda: 0.428 – Poland Wilks' lambda: 0.512 – Ukraine			Sex	
		Wilks' lambda	F value	p value	women	men
Eastern Poland	Participation in cultural events in various regions of the country and the world	0.489	32.165	0.001*	2.453	2.119
	Articles in the press dedicated to health	0.502	1.648	1.199	1.602	1.679
	Radio programs dedicated to the subject of regional products	0.465	40.074	0.001*	0.974	1.320
	Constans				9.403	9.238
Western Ukraine	Participation in cultural events in various regions of the country and the world	0.512	3.296	0.069	2.098	1.973
	Articles in the press dedicated to health	0.582	18.007	0.008*	1.207	0.843
	Radio programs dedicated to the subject of regional products	0.519	48.480	0.001*	1.179	1.768
	The use of popular websites	0.538	53.789	0.001*	2.541	2.005
	Culinary guides sent by email	0.529	18.389	0.001*	1.129	1.456
	Publications in the local and national press	0.528	62.387	0.001*	2.990	2.339
	Constans				16.987	17.092

*Level of significant difference at $p < 0.050$.

Source: Author's own analysis based on study material.

information, having positive effects on the increase of consumption of such products.

All kinds of promotional events in the form of regional fairs such as „Lubelskie smakuje” were of great importance for respondents from Eastern Poland. Also festivals of flavors are very popular, where consumers can get acquainted with regional products [Sim 2009]. It is worth creating local food promotion programs [Onken et al. 2011, Sala 2011], like in some US states such as Maryland or Pennsylvania, which involve informing consumers about products of a particular region.

Residents of Western Ukraine rated radio and television as well as folders and leaflets as important sources of information. In the case of Polish group, these sources of information were of less significance. However, the Internet was important for both groups of respondents.

Above-mentioned sources of information also corresponded with the forms of promotion which were considered the most appropriate by respondents. This concerned folders and leaflets that were particularly important for residents of Western Ukraine. Both groups of respondents indicated television and radio as the important elements of the promotion. Polish residents, especially women, to a greater extent emphasized the role of local fairs as the best form of promotion of regional products.

The motives for purchasing and consuming regional products are related to their high quality and originality. This was appreciated both by residents of Eastern Poland and Western Ukraine. The motive of traditional and natural production of such products was raised especially by Ukrainians, what corresponded to studies carried out by Bianchi [2017]. Women in particular pointed to health motives, as it was shown in Grzybek’s studies [2009] which indicated that women, unlike men, attach greater importance to the quality of products and originality of taste. What is more, women, unlike men, trust their friend’s recommendations to a lesser degree.

An important motive was also the encouragement of family and friends, a motive that corresponded to the source of knowledge about regional products.

According to respondents, the main sources of promotion are the participation and showing products during regional exhibitions and fairs. Men, to a greater extent than women, associated promotion of regional products with websites and publications in regional magazines. Peštek and Činjarević [2014] claim that local products are an important element of regional promotion and a good advertisement of the country abroad.

Both in Poland and Ukraine women drew greater attention to the promotion of regional products than men. In both countries, the promotion of regional products was emphasized through culinary guides as well as radio and television broadcasts. Czeczelewski et al. [2017] drew attention to the press and TV commercials as the important sources of promotion of local products. They indicated in their studies that one of the main reasons for buying regional food was a desire to try the flavors of the region.

According to Bearsworth et al. [2002], and also confirmed by this study, men and women have different opinions about food, therefore they are motivated by different motives when purchasing the same product. The thesis has been confirmed that women more than men value high quality products as well as prefer food with high nutritional values and health values [Chen 2011]. This can be attributed to the fact that mostly women buy food products, take care of high quality meals, pay attention to information about different food products and are willing to pay higher price for their originality SERIO [2008].

The development of regional products contributes to the sustainable development of a specific area, namely to: stimulate and support agricultural activity and food production, increase the attractiveness of tourism, strengthen the position of the community, build the local identity [Rand et al. 2003].

The development of region can be significantly stimulated through the development of regional products, strengthening its territorial potential and tourism attractiveness. It contributes to the enrichment of gastronomic and tourism offers of a single agritourism farm, the town itself and, consequently, the whole region. Regional products are a tool useful to promote tourism in rural areas.

Regional food increases the attractiveness of the food sector in the eyes of consumers, who appreciate the innovativeness of this sector [Barska and Wojciechowska-Solis 2018]. It is consistent with the market trend, whereby consumers want to experience and “taste” the region they visit. The number of Polish regional products submitted for registration in the EU and national institutions is systematically growing. In practice, this will contribute to the increase in income of the rural community, as well as the promotion of the regions of their production. Considering that GDP per capita in Poland is USD 15,050 and in Ukraine USD 2,906, the increase of income of the society of both countries will also allow Poland and Ukraine to reduce the income gap of the population in relation to countries such as Estonia or the Czech Republic³.

The obstacles to the development of the market of regional products may be their high price and consumer’s ignorance. Producers of regional products must also eliminate infrastructural and market barriers. Limiting these barriers will allow them to benefit more from the growing demand for regional food.

The development of regional food in Poland and Ukraine depends on the efficiency of institutions supporting the food chain at its various stages [cf. Barham et al. 2012]. They should support production and distribution as well as offer marketing services in the field of promotion, allowing easier access to new and additional markets, where independent access is difficult or even impossible.

CONCLUSIONS

1. The most important promotional activities are related to presenting regional food products at regional and foreign exhibitions, fairs and events. Programs should be introduced that will promote regional products and indicate their positive impact on health of the local community as well as development of local entrepreneurship.

2. Due to the fact that women are more involved in family shopping and meal preparation, they pay more attention than men to the problem of promoting regional products.

3. There were differences between women and men and between residents of Eastern Poland and Western Ukraine in the opinion on the promotion and significance of regional products. However, in general, it can be stated that respondents of both groups see the need to participate in the promotion of regional food products.

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³ As at 30 July 2018 according to World Bank database.

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PROMOCJA REGIONALNYCH PRODUKTÓW ŻYWNOŚCIOWYCH NA TERENIE WSCHODNIEJ POLSKI I ZACHODNIEJ UKRAINY

STRESZCZENIE

W artykule podjęto próbę określenia stosunku mieszkańców wschodniej Polski i zachodniej Ukrainy do regionalnych produktów spożywczych. Celem pracy była ocena elementów promocji, które zachęcają konsumentów do zakupu produktów regionalnych.

W badaniu wykorzystano autorski kwestionariusz ankiety, który posłużył przebadaniu 1128 respondentów z Polski oraz 1072 z Ukrainy. Do pomiaru postaw wykorzystano pięciostopniową skalę Likerta, po wcześniejszym zastosowaniu procedury konstrukcji i walidacji. Przy analizach statystycznych wykorzystano program Statistica 13.1 PL.

W opinii ankietowanych z obu krajów najważniejszym działaniem promocyjnym jest prezentowanie żywnościowych produktów regionalnych na wystawach, kiermaszach i imprezach o zasięgu nie tylko krajowym, ale i zagranicznym.

Wzrost zainteresowania regionalnymi produktami jest przejawem nowych tendencji żywnościowych, a w szczególności konserwacją zachowań i wartości wynikających z dziedzictwa kulturowego Polski i Ukrainy. Jest to również związane z wysoką jakością produktów regionalnych. Odpowiednia promocja pomaga konsumentom dostrzec wartość regionalnych produktów.

Słowa kluczowe: produkty regionalne, wschodnia Polska, zachodnia Ukraina, żywność regionalna

OPTIMAL UTILIZATION OF EUROPEAN UNION GRANTS – A CASE STUDY

Jadwiga Zaród  

West Pomeranian University of Technology in Szczecin

ABSTRACT

Following Poland's accession to the European Union, farmers were given new opportunities to make use of various form of support from EU funds. The goal of this work is to show the utilization of EU funds by an agricultural farm and optimization of its production. The task was made possible by means of two multicriteria linear-dynamic optimization models. The first model accounted for real production structure and EU subsidies. The subsidies were not included in the second model. The empirical material constituted real data on an agricultural farm located in the commune of Nowogard (West Pomeranian Voivodship). The results of the solutions indicated over a threefold increase of agricultural income, agricultural production and the amount of organic substance supplemented to the soil of an agricultural farm accounting for EU grants.

Key words: grants, multicriteria optimization models, agricultural income, agricultural production, soil organic matter

INTRODUCTION

Poland's admittance into the European Union (in 2004) gave rise to new conditions for development of agriculture and a wide range of opportunities for using various forms of support from EU funds. Acquiring subsidies makes it easier for young farmers to make a start [Parlińska et al. 2014], allows for modernization of agricultural farms [Lorencowicz and Cupiał 2013, Grzelak and Kiełbasa 2014], supports farming in areas with unfavorable conditions [Musiał 2010], favors development of rural areas and services for rural population [Bórawski 2010]. Particular financial support is realized as part of agro-environmental programs which are related to environmental protection [PROW 2014].

The goal of this work is to show the utilization of EU funds by X agricultural farm and optimization

of its production. The task will be made possible by means of two multicriteria linear-dynamic optimization models. Whereas the hypothesis to be verified in the undertaken research states that multicriteria linear-dynamic optimization models can be a useful tool for supporting the planning of structure and profitability of production in an agricultural farm.

Within the professional literature, one can find confirmation for utilization of optimization models in agricultural production. For instance, the problem of field irrigation was tackled by Riesgo and Gómez-Limón [2006]. They built optimization models for agricultural farms located in the Douro river valley in Spain. Whereas Rodriguez et al. [2009] used a linear stochastic programming model for planning swine breeding. Manos et al. [2013], by use of multicriteria optimization models, researched sustainable development of agricultural production in the region of Tasalia (Greece).

Zieliński and Ziętara [2017] also made an attempt at determining the economic situation of farms specializing in cultivation of cereals, oil and protein plants by means of linear-dynamic optimization models.

In this work, production in X agricultural farm located in the West Pomeranian Voivodship in the Nowogard commune was optimized in the years 2013–2016.

RESEARCH MATERIAL

The X agricultural farm has 344 ha of bonitation class IV agricultural land, including 225,11 ha of meadows and pastures, and 118.89 ha of arable land. The activities of this farm are concentrated around cultivation of cereals, rapeseed and horse bean, as well as hay harvest from meadows and pastures. Rapeseed is grown every year, whereas horse bean and wheat – every two years, similar to rye and triticale. Moreover, 3.89 ha of the farm's land is dedicated to cultivation of melliferous plants, such as: borage, phacelia and melilot. These plants are utilized by bees for production of honey

which is used by the family members. Grasslands take up over 65% of the area, and 1/8 of their area is part of the Natura 2000 program. Species of plants and birds under protection can be found in these areas. The X farm does not deal with animal husbandry, and the harvested hay is sold to nearby fur animal farms.

Two people are engaged in work on the farm. Moreover, one additional worker is hired during the period of increased demand for manpower (harvest season).

The farm is equipped with basic agricultural machines and tools.

EU grants constitute a significant part of the analyzed farm's income. Within the examined period, the agricultural farm used such subsidies as:

- uniform area payment,
- area payment for the area of leguminous and small-grained papilionaceous crops,
- payment for greening,
- payment for high protein crops.

Table 1 shows basic data on the X agricultural farm in the years 2013–2016.

Table 1. Characteristics of the X farm

Specification	2013	2014	2015	2016
Sown structure (%)	100	100	100	100
winter rye	42.48	–	42.48	–
beans	18.82	–	16.91	–
rape	35.43	42.48	37.34	19.67
melliferous plants	3.27	3.27	3.27	3.27
winter wheat	–	37.34	–	54.25
triticale	–	16.91	–	22.81
Crop yields (dt·ha ⁻¹)				
winter rye	40	–	50	–
beans	34	–	35	–
rape	35	37	34	35
winter wheat	–	65	–	62
triticale	–	56	–	50
hay from meadows and pastures	68	70	72	67
Selling prices of crops (PLN·dt ⁻¹)				
rye	55	–	57	–
beans	120	–	86	–
rape	160	140	150	170
wheat	–	70.20	–	72
triticale	–	54.30	–	62
hay from meadows and pastures	45	39	44	40

Table 1 – cont.

Specification	2013	2014	2015	2016
Plant cultivation costs (PLN·ha⁻¹)				
winter rye	3 210.23	–	3 072.20	–
beans	4 152.00	–	3 502.20	–
rape	5 100.20	5 020.30	4 300.30	4 520.20
winter wheat	–	3 820.50	–	3 789.20
triticale	–	3 510.20	–	3 572.40
hay from meadows and pastures	3 420.10	3 152.82	3 203.80	2 890.30
Crop subsidies (PLN·ha⁻¹)				
rye	830.30	–	758.01	–
beans	1 549.73	–	1 180.01	–
rape	830.30	910.87	758.01	772.15
wheat	–	910.87	–	772.15
triticale	–	910.87	–	772.15
melliferous plants	830.30	910.87	758.01	772.15
meadows and pastures	830.30	910.87	758.01	772.15
Agricultural income with subsidies (PLN·ha⁻¹)				
winter rye	95.07	–	535.81	–
beans	1 477.73	–	687.81	–
rape	1 330.10	1 070.57	1 557.71	2 201.95
winter wheat	–	1 653.37	–	1 446.95
triticale	–	441.47	–	299.75
hay from meadows and pastures	470.20	488.05	722.21	562.15

Source: Own work based on Luter [2017].

Income acquired from honey production in the examined years covered the expenses of growing honey plants. Grants for these crops constituted the farmer's income. Other benefits for farming derived from the presence of bees were presented by Majewski [2010].

RESEARCH METHOD

The main research method are multicriteria optimization models. Their mathematical notation, adopted for agricultural (plant) production, takes the form of [Krawiec 1991]:

$$\mathbf{ax}(t) \leq \mathbf{b}(t) \quad \text{– limiting conditions} \quad (1)$$

$$\mathbf{x}(t + 1) \leq \mathbf{x}(t) + \mathbf{f}_t[\mathbf{x}(t), \mathbf{u}(t)] \quad \text{– dynamics equations} \quad (2)$$

$$F = \max \{F_1, F_2, F_3\} \quad \text{– control criterion} \quad (3)$$

$$\mathbf{x}(t) \geq 0, \mathbf{u}(t) \geq 0 \quad \text{– boundary conditions} \quad (4)$$

where:

t – states (in consecutive production years), $t = 0, 1, 2, \dots, k$;

\mathbf{a} – vector of technical and economic parameters;

$\mathbf{b}(t)$ – vector of limitations in subsequent states;

$\mathbf{x}(t)$ – vector of state t ;

$\mathbf{u}(t)$ – control vector;

$\mathbf{x}(t + 1)$ – vector of state in the year $t + 1$.

It should be assumed that the initial state of the system at the moment of $t = 0$ is known and describes the plant area at the moment preceding the first year of research. In formula (1), there are state limitations which are related to the area of arable land and grassland.

The $\mathbf{u}(t) = \mathbf{u}_{ij}(t)$ control vector presents flows within the farm or between the farm and the environment. Components of this vector described areas of consecutive plants at the time of the farm's transition from state t to $t + 1$. The i, j indices determine the order of consecutive crops, e.g. plant j will be grown after plant i .

Dynamics equations for plant production take the form of:

$$x_i(t+1) = \sum_p u_{pi}(t) \quad (5)$$

where:

$x_i(t+1)$ – area i – of this plant grown in the year $t+1$;
 $u_{pi}(t)$ – area of various p forecrops after which i – this plant in the year – is grown $t+1$.

The F_1 goal criterion relates to gross agricultural income and is expressed by the formula:

$$F_1 = \sum_t [\mathbf{m}(t)^T \mathbf{u}(t) + \mathbf{w}(t+1)^T \mathbf{x}(t+1)] \rightarrow \max \quad (6)$$

where:

$\mathbf{m}(t), \mathbf{w}(t+1)$ – unitary income vector for the variables of state and control indicating commodity activities.

The F_2 function is a control criterion maximizing the production volume by the forms of:

$$F_2 = \sum_t [\mathbf{g}(t)^T \mathbf{u}(t) + \mathbf{k}(t+1)^T \mathbf{x}(t+1)] \rightarrow \max \quad (7)$$

where:

$\mathbf{g}(t), \mathbf{k}(t+1)$ – unitary efficiency vector of control and state variables in the subsequent years;

The F_3 function maximized the amount of organic substance in the soil:

$$F_3 = \sum_t [\mathbf{o}(t)^T \mathbf{u}(t) + \mathbf{p}(t+1)^T \mathbf{x}(t+1)] \rightarrow \max \quad (8)$$

where:

$\mathbf{o}(t), \mathbf{p}(t+1)$ – vector of unitary coefficients of reproduction and degradation of soil for state and control variables.

Multicriteria optimization models of the X agricultural farm will be solved by means of objective programming. Its creators are Charnes and Cooper [1961], and the solution method was described by Szapiro [2001].

CONSTRUCTION AND SOLUTIONS OF OPTIMIZATION MODELS

Based on data on the X farm in the years 2013–2016, two linear-dynamic optimization models were constructed. These models were composed of 27 state and control variables, and 41 limiting conditions. The models' variables were related to the area of individual crops, whereas the area of arable land and permanent grassland are the models' constant terms. Limiting factors of the model described the state in each of the analyzed years (four stages of the model, and dynamics equations bound individual stages by means of plant rotation. The succession of crops in the subsequent years, reflecting the real sowing structure, is presented in Table 2.

Objective functions maximized the agricultural income and agricultural production, and minimized the loss of organic substance in the soil. Agricultural income constituted the income from individual crop along with grants minus production costs. Agricultural production are crops of plants for sale. Whereas the amount of organic substance in the soil was determined based on indices of reproduction and degradation by Eich and Kindler [Fotyma and Mercik 1992].

The first model accounted for EU grants. In the second model, the grants were omitted in order to show the differences in profitability of agricultural production.

Table 2. Crop rotation

Year	Field I	Field II	Field III	Field IV
2013	rape	beans	rye	melliferous plants
2014	triticale wheat	wheat	rape	melliferous plants
2015	rape beans	rape	rye	melliferous plants
2016	wheat	wheat	triticale rape	melliferous plants

Source: Own work.

The solution of the first model indicated the area of individual crops and the acquired value of agricultural income, agricultural production and the amount of organic substance supplemented to the soil in the analyzed years and over the entire examined period (Table 3).

The optimal solution is in line with the principles of the Code of Good Agricultural Practice [Duer et al. 2004] and accepted plant rotation. Plant succession ensures timely performance of all agro-technical work, and proper coverage of soils with plants. It also meets the requirements of the Agency for Restructuring and Modernization of Agriculture imposed on farmers applying for grants¹. In agricultural production, there must be at least three different crops each year, out of which the main crop cannot exceed 75% of the sown area. A minimum of 5% of the crops must meet the pro-environmental conditions (e.g. cultivation of melliferous plants, papilionaceous plants and permanent grasslands in the area of Natura 2000). The conse-

quence of not adhering to these requirements is lack of grants. The greatest income was achieved in the year 2016 (PLN 282,301.14). Mainly due to cultivation of wheat the area of which took up 54.25% of the general sown area this year. The volume of income in subsequent years were also significantly influenced by grasslands, especially grants for their area. Favorable agro-climatic conditions in the year 2014 contributed to the increase in agricultural commodity production. Positive balance of organic substance in the soil proves the natural environment is not degrading. The main source of supplementing the soils with organic matter is the X farm was plowed straw of rapeseed, cereal and meadows. Too much organic matter supplied into the soil is not desirable, either. It can lead to pollution of grounds and surface waters with biogens [Smagacz 2000]. The optimal solutions indicates that each hectare of soils in the farm was enriched every year with about 987 kg (1,357.60 t / 4 / 344 ha) of organic substance, which will not lead to pollution of waters.

Table 3. Optimal solution of a model of X farm using EU grants

Specification	2013	2014	2015	2016
Arable land (ha)	118.89	118.89	118.89	118.89
winter rye	50.50	–	50.50	–
beans	22.38	–	20.10	–
rape	42.12	50.50	44.40	23.38
melliferous plants	3.89	3.89	3.89	3.89
winter wheat	–	44.40	–	64.50
triticale	–	20.10	–	27.12
Meadows and pastures (ha)	225.11	225.11	222.11	222.11
Agricultural income (PLN)	202 967.93	249 749.07	275 564.59	282 301.14
Agricultural income (PLN)	1 010 582.74			
Agricultural production (dt)	19 562.71	21 486.27	20 946.17	21 255.67
Agricultural production (dt)	83 250.83			
Organic matter (t)	331.9186	341.2239	345.2761	339.1818
Organic matter (t)	1 357.60			

Source: Own calculations.

¹ ARiMR website, www.arimr.gov.pl.

For comparison, a second dynamic optimization model was built for the X farm, in which EU grants were not accounted for. The cost of rye, horse bean and triticale cultivation exceeded the income acquired from selling the seeds of these plants. Maintaining one's own permanent grassland with no farm animals turned out to be unprofitable. A possible optimal solution, not accounting for real production structure, is shown in Table 4.

Table 4. Optimal solution of a model of X farm not using EU grants

Year	Field I	Field II
2013	rape 115 ha	melliferous plants 3.89 ha
2014	wheat 115 ha	melliferous plants 3.89 ha
2015	rape 115 ha	melliferous plants 3.89 ha
2016	wheat 115 ha	melliferous plants 3.89 ha

Source: Own calculations.

The solution of model two indicates that rapeseed and wheat should be grown interchangeably, every two years. Too frequent cultivation of wheat on the same field is not beneficial. It can lead to crop rotation diseases and worsen the soil culture.

The cost of melliferous plant cultivation negated the income from honey sales. The acquired agricultural income in 2013–2016 (PLN 312,432) was three times lower than that achieved in the solution of the X farm with grants. Moreover, agricultural production (22,540 dt) was decreased by 73%, and the amount of organic substance supplied yearly to the soil was lowered to $0.28 \text{ t} \cdot \text{ha}^{-1}$ ($391 \text{ t} / 4 / 118.89 \text{ ha}$).

SUMMARY AND CONCLUSIONS

The work made an attempt at using linear-dynamic optimization models to determine the production structure in X farm. A model constructed based on real data meets the requirements of the Agency for Restructuring and Modernization of Agriculture imposed on farmers applying for EU grants. For comparison, a model not accounting for grants was constructed and solved.

The research leads to the following conclusions:

1. Production structure resulting from the X agricultural farm's model solution where grants were accounted for ensures proper plant rotation, timely execution of agro-technical work, and does not degrade the natural environment. The solution of the second model does not ensure biodiversity, and too frequent cultivation of wheat on the same field can lead to decreased harvest.
2. The acquired production results (agricultural income, agricultural production, the amount of organic substance supplied to the soil) in the X agricultural farm's model solution with grants in the years 2013–2016 were over three times higher than those for this farm without grants.
3. Multicriteria linear-dynamic optimization models can be an efficient tool supporting examination of production profitability in agricultural farms.

Moreover, the allow for determination of the degree of soil reproduction and degradation.

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OPTIMALNE WYKORZYSTANIE DOTACJI UNIJNYCH – STUDIUM PRZYPADKU

STRESZCZENIE

Po przystąpieniu Polski do Unii Europejskiej rolnicy uzyskali nowe możliwości korzystania z różnych form wsparcia z funduszy unijnych. Celem tego opracowania jest pokazanie wykorzystania dotacji unijnych przez gospodarstwo rolne w celu optymalizacji swojej produkcji. Realizację tego zadania umożliwiły dwa wielokryterialne liniowo-dynamiczne modele optymalizacyjne. Pierwszy model uwzględnił rzeczywistą strukturę produkcji i dopłaty unijne. W drugim modelu pominięto dotacje. Materiał empiryczny stanowiły rzeczywiste dane o gospodarstwie rolnym znajdującym się w gminie Nowogard (województwo zachodniopomorskie). Wyniki rozwiązań wskazały ponadtrzykrotny wzrost dochodu rolniczego, produkcji rolniczej i ilości substancji organicznych dostarczanych do gleby gospodarstwa uwzględniającego dotacje unijne.

Słowa kluczowe: dotacje, wielokryterialne modele optymalizacyjne, dochód rolniczy, produkcja rolnicza, materia organiczna gleby

CONTENTS SPIS TREŚCI

Wioletta Bieńkowska-Golasa	
Film tourism in the promotion of selected tourist destinations	5
Turystyka filmowa w promocji wybranych destynacji turystycznych	
Piotr Bórawski, Aneta Beldycka-Bórawska, Mariola Grzybowska-Brzezińska, Jayson K. Harper	
Impact of new member states accession on food safety and obesity in the European Union	13
Wpływ akcesji nowych krajów członkowskich na bezpieczeństwo żywności i otyłość w Unii Europejskiej	
Marcin Chciałowski	
The importance of transport infrastructure investments in regional development of the Norte Region in Portugal and the Masovian Voivodship in Poland	23
Znaczenie infrastrukturalnych inwestycji transportowych w rozwoju regionalnym regionu Norte w Portugalii oraz województwa mazowieckiego w Polsce	
Alina Danilowska	
Changes in European Union farm structure and their multidimensional implications	31
Zmiany w strukturze gospodarstw rolnych w Unii Europejskiej i ich wielowymiarowe skutki	
Marcin Dudziński, Ewa Wasilewska	
Application of k -records in the interval estimation of the value at risk measure (VaR)	41
Zastosowanie k -tych rekordów w estymacji przedziałowej wartości zagrożonej ryzykiem (VaR)	
Ewa Ferens	
Wage convergence on the county-level in Poland: a panel data approach	51
Konwergencja wynagrodzeń na poziomie powiatów w Polsce: podejście panelowe	
Edyta Gheribi, Gultekin Altuntas, Alessandro Bonadonna	
Innovations in the foodservice business in large Polish cities	59
Innowacyjność w biznesie usługowym w wybranych przykładach z zakładów gastronomicznych w dużych miastach w Polsce	
Jarosław Gołębiewski	
Economic performance of sectors along the food supply chain – comparative study of the European Union countries	69
Wyniki ekonomiczne sektorów w łańcuchu dostaw żywności – badania porównawcze krajów Unii Europejskiej	
Sławomir Jarka	
The problem of the optimal volume of enterprise production in the light of the theory of transaction costs and the practice of outsourcing	79
Problem optymalnej wielkości produkcji przedsiębiorstwa w świetle teorii kosztów transakcyjnych i praktyki outsourcing	
Sylwester Kozak	
Efficiency of non-life insurance companies and its determinants	87
Efektywność zakładów ubezpieczeń majątkowych i jej determinanty	
Marzena Lemanowicz	
Theory of contracts in the light of new institutional economics. The specificity of agricultural contracts	97
Teoria kontraktów w świetle nowej ekonomii instytucjonalnej. Specyfika kontraktów rolnych	

Renata Lisowska	
Application of it tools in managing small and medium-sized enterprises in the context of creating entrepreneurial orientation	105
Zastosowanie narzędzi informatycznych w zarządzaniu małym i średnim przedsiębiorstwem w kontekście kreowania orientacji przedsiębiorczej	
Anna Mazurkiewicz-Pizło, Wojciech Pizło	
Determinants of the development of vineyards and wine tourism in Poland	115
Czynniki oddziałujące na rozwój winiarstwa i enoturystyki w Polsce	
Marta Postuła, Jacek Tomkiewicz, Justyna Sobolewska	
Convergence programmes as an economic policy tool within the European Union	123
Programy konwergencji jako narzędzie polityki gospodarczej w Unii Europejskiej	
Janina Sawicka, Paulina Stolarczyk	
Changes in human capital resources in the labour market in Poland from the perspective of the European Union and other countries	133
Zmiany w zasobach kapitału ludzkiego na rynku pracy w Polsce z perspektywy Unii Europejskiej i innych krajów	
Jolanta Słonec, Sabina Motyka, Anna Kaczorowska	
Generations of the development of IT outsourcing in Poland	141
Generacje rozwoju outsourcingu informatycznego w Polsce	
Wioletta Sobczak, Rafał Zbyrowski, Bolesław Borkowski	
Spatial integration of vegetable wholesale markets in Poland on the selected example	151
Integracja przestrzenna rynków hurtowych warzyw w Polsce na wybranym przykładzie	
Jakub Staniszewski, Andrzej Czyżewski	
Interdependence of economic and environmental efficiency in agriculture in the European Union	159
Współzależność efektywności ekonomicznej i środowiskowej w rolnictwie Unii Europejskiej	
Elżbieta Roszko-Wójtowicz, Iwona Laskowska, Maria M. Grzelak	
Assessment of the relationship between innovations and economic performance of manufacturing enterprises in Poland	171
Ocena związków między innowacjami a wynikami ekonomicznymi przedsiębiorstw przetwórstwa przemysłowego w Polsce	
Wioletta Wierzbicka	
The regional differentiation of knowledge potential in Poland in the context of building a knowledge-based economy	179
Regionalne zróżnicowanie potencjału wiedzy w Polsce w kontekście budowania gospodarki opartej na wiedzy	
Julia Wojciechowska-Solis, Andrzej Soroka	
Promotion of regional food products in Eastern Poland and Western Ukraine	189
Promocja regionalnych produktów żywnościowych na terenie wschodniej Polski i zachodniej Ukrainy	
Jadwiga Zaród	
Optimal utilization of European Union grants – a case study	199
Optymalne wykorzystanie dotacji unijnych – studium przypadku	

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