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The Potential of Polish Bioeconomy Compared to the European Union Countries

Potencjał biogospodarki w Polsce na tle krajów Unii Europejskiej

Introduction

In view of the increasing utilisation of natural resources due to the growing population and scale of human activity, the main challenges to the contemporary world include natural environment protection, combating climate change and sustainable use of natural resources (Adamowicz, 2017). The natural environment deteriorates, which necessitates changes in management processes. Therefore, the strategies for the development of the European Union (EU) presented at the beginning of the new century portrayed bioeconomy as a modern concept to ensure the sustainable and dynamic development of EU member states and the bioeconomy itself became an important area of interest to the European authorities and an essential element of various Community policies (European Commission [EC], 2012). In bioeconomy a closed-loop cycle of matter exists and wastes are used for production and generation of renewable energy (Zilberman, Gordon, Hochman & Wesseler, 2018). The core premise for formulating such a development concept is the need for transforming the economy based on conventional energy sources (Chyłek, 2016).

The Organisation for Economic Co-operation and Development (OECD) defines bioeconomy as making use of biotechnology, bioprocesses and bio-based products to produce new, sustainable, eco-efficient and competitive products and services (Organisation for Economic Co-operation and Development [OECD],

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2009). The European Commission (2012) defined bioeconomy as sustainable production and conversion of biomass into various products, including foodstuffs, pharmaceuticals, fibres, industrial products and energy. It also covers a set of economic operations and activities related to bio-based products used for creating economic value, growth and benefits to society. Maciejczak and Hofreiter (2013) mentioned the multi-faceted nature of this concept and more than ten definitions of "bioeconomy". This area of the EU economy has become a fundamental element of smart and sustainable economic growth. Thus, the European bioeconomy offers a new outlook on conventional high-value manufacturing and provides new opportunities and jobs both in rural and urban areas. There is also a chance of boosting productivity and growth through improvement in the competitiveness of domestic industry thanks to high technology and decreased dependence on raw materials imports by reclamation of marginal lands and utilisation of locally generated wastes and residues (D'Adamo, Falcone & Morone, 2020). The processes of creating and diffusing knowledge embedded in new products and processes play a key role in the bioeconomy (Kijek & Chojnacki, 2016). The term "bioeconomy" is quickly gaining significance, which increases the need for research in this area (Lakner, Oláh, Popp & Balázs, 2021). Czernyszewicz (2016) underlines that the accomplishment of the vision of bioeconomy supported by innovation will require a wide range of knowledge-based studies, maintaining the existing and creating new innovation supporting instruments, creating a framework for stimulating enterprise, evaluating risks and benefits related to the implemented changes and developing a programme for youth education and specialist training in new activities and sectors of bioeconomy. A bioeconomy is, above all, a challenge, an opportunity and a way to integrate actions to solve economic and environmental problems. The basis for setting development strategies and designing specific instruments to support the development of the bioeconomy is an assessment of its potential and identification of those areas that require special attention. Pink and Wojnarowska (2020) emphasise that there are still differences between member states in the European Union. Conditions for bioeconomy development include different premises and their importance depends on the specificity of the country and the priorities considered in the documents as strategic.

This article aims to assess the potential of the Polish bioeconomy and compare it to other European Union member states. The timeline of the study was 2008 and 2017, which allowed evaluating changes that occurred over a decade. The potential of the examined sector was analysed according to the employment level, labour productivity and gross value added.

1. Literature review

The bioeconomy concept is a response to the problems and challenges of today's world (Czyżewski, Grzyb, Matuszczak & Michałowska, 2021). Although a lot of damage due to irresponsible management cannot be reversed, the contemporary generation is responsible for redesigning the management into a different paradigm and reformulating the management objectives, and – most importantly – implementing methods of production that will not generate external effects (Pink & Wojnarowska, 2020). The transformation towards a bio-based society leads to a reduced volume of wastes, optimised utilisation of crops, development of bio-based alternatives to oil-derivative materials such as bio-based plastics, bio-based chemicals, and bio-based energy, as well as the production of high-quality nutrients and protein-rich feeds (Pink & Wojnarowska, 2020).

In Europe political discourse on the bioeconomy emerged at the beginning of the 21st century. Numerous international institutions (e.g., OECD, European Commission) offering expert support in implementing scientific research and innovation in economic practice have contributed to disseminating various definitions of bioeconomy. In its communication on bioeconomy for Europe (EC, 2012), the European Commission emphasizes that Europe needs a radical change in its approach to production, consumption, processing, storage, recycling and disposal of bio-based resources. This was corroborated by the Europe 2020 Strategy which sees bioeconomy as a key element of Europe's smart and green growth. The bioeconomy achieves sustainable development goals, allowing for sustainable economic growth (Szymańska, Korolko, Chodkowska-Miszczuk & Lewandowska, 2017). This sector is a capacious category that concerns innovative production as well as activities that rely on the use of biological resources (Jonsson et al., 2021). The basic raw material for knowledge-based bioeconomy is biomass. Its primary sources are: agriculture, forestry, marine resources and various types of waste (Maciejczak, 2015). The market for bio-based products is growing and it is expected that in 2030 the demand for such goods will reach EUR 50 billion (Bell et al., 2018).

The growing interest in the bioeconomy concept is a result of challenges faced by the global economy including prudent management of natural resources, sustainable production, health care, climate change mitigation and the balancing of social, economic and environmental goals. (Bell et al., 2018; Szarek, 2020). Increased production, reduction in biodiversity, unstable prices of agricultural products and product price speculations, non-agricultural use of biomass, urbanisation of rural areas and a growing demand for public goods are also global

challenges. Therefore, for several years many Community documents have been assigned a clear priority in the bioeconomy development strategy (Czyżewski et al., 2021). This concept is also being implemented on an increasingly wider scale in many EU member states (Liobikiene et al., 2021). Furthermore, the EU as an international organisation that has focused on sustainable development for years, also takes more effort to develop bioeconomy at an international level, which is illustrated, for instance, by its official strategy documents (EC, 2018).

Gołębiewski (2019) underlines that the development of scientific research, notably related to biotechnology, including molecular biology, genetic engineering, and bioengineering, accompanied by the development of innovation diffusion systems, clearly offers wider possibilities for developing new processes and products in the system of bioeconomy. In turn, Adamowicz (2017) claims that bioeconomy is the basis for an interdisciplinary approach to economic development combining scientific research, and know-how in biotechnology with real economic processes.

D'Adamo et al. (2020) note the scarcity of multi-faceted research of socio-economic effects of the bioeconomy, this sector's contribution to the present-day economic and environmental transformation, the role of primary sectors in the bioeconomy and the potential of the unexplored resources to be used as biofuels and bioproducts. Some authors underlined a necessity to introduce metrics to monitor the development of the bioeconomy (O'Brien, Wechsler, Bringezu & Schaldach, 2017). In response, Ronzon and M'Barek (2018) proposed a set of socio-economic indicators for analysing and comparing the bioeconomy of EU member states, including hybrid sectors. By contrast, D'Adamo et al. (2020) in their study presented SEIB (Socioeconomic Indicator for the Bioeconomy) – a dimensionless indicator derived from the interaction between three variables: 1) the characteristics of the socio-economic situation of the sectors, 2) the weight of these characteristics for each sector, 3) the weight of sectors that rely on bio-based products.

Value added and employment are the most popular indicators for monitoring the bioeconomy and measuring its potential (Kuosmanen et al., 2020). Bioeconomy features a significant social potential, since it is expected to create one million new jobs by 2030, notably in rural and coastal areas (Pink, 2020). In addition, labour resources are a fundamental source of competitiveness for the sector (Kryńska, 2004). These measures were used in this paper considering the years 2008–2017 in the analysis. The bioeconomy sector in Poland mostly relies on traditional primary production sectors: agriculture, forestry and food production, and to a lesser extent – on chemical, biotech and energy industry. Nevertheless, bioeconomy provides 20% of jobs in Poland and the production value of this sector corresponds to ca. 10% of the overall production value (Bio-based Industries

Consortium, 2018). In 2017, the Polish bioeconomy employed 2.49 million people, i.e., 18.5% less than in 2008. In that period the average annual decrease in employment in the sectors of bioeconomy amounted to 57.7 thousand people. In the European Union employment in the bioeconomy could be also observed to decrease, given an average annual decrease of 276 thousand people (JRC, 2021). However, the labour resources of this sector are still significant – ca. 17.5 million people in 2017, that is, 8.9% of all workers (Ronzon et al., 2020).

2. Research methods

The bioeconomy covers a wide variety of economic sectors and enables sustainable growth in the Member States of the European Union. This paper evaluates the competitive potential of Polish bioeconomy compared to the EU's potential using an official classification of economic activity in Europe (NACE). Bioeconomy components were adopted after the Report of the EU Joint Research Centre (M'Barek, Parisi & Ronzon, 2018). The following sectors of bioeconomy were identified: 1) Agriculture (A01), 2) Forestry (A02), 3) Fishing and aquaculture (A03), 4) Food, beverage and tobacco (C10, C11, C12), 5) Bio-based textiles (C13, C14, C15), 6) Wood products and furniture (C16, C31), 7) Paper (C17), 8) Bio-based chemicals, pharmaceuticals, plastics and rubber (excl. biofuels) (C20, C21, C22), 9) Liquid biofuels (C2014, C2059), and 10) Bio-based electricity (D3511). The NACE classification does not distinguish between bio-based and non–bio-based activities. Nine of the abovementioned micro-sectors use exclusively biomass as feedstock (A01, A02, A03, C10, C11, C12, C15, C16 and C17), while the other nine are hybrid because they use feedstock that is either biomass or carbon fossil-based (C13, C14, C31, C20, C21, C22, C2014, C2059 and D3511) (D'Adamo et al., 2020).

The potential of bioeconomy was analysed taking into account:

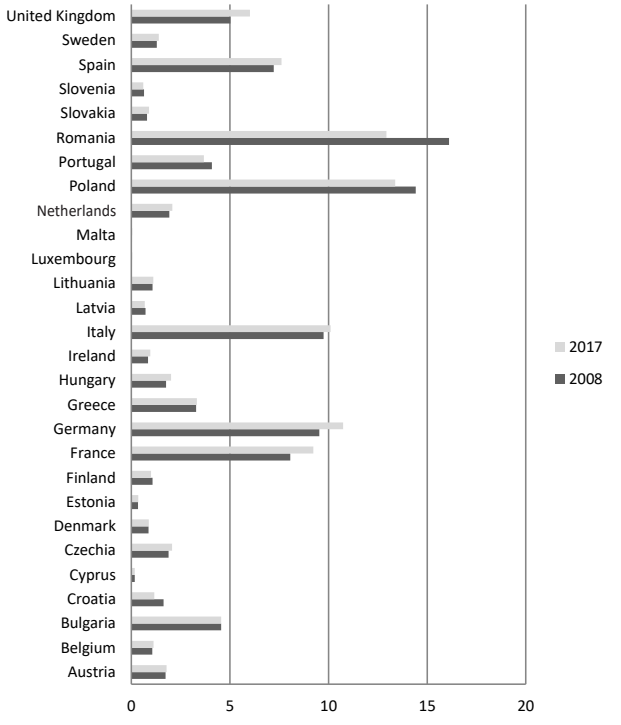
- the share of member states in the total number of bioeconomy workers in the EU,
- the structure of employment according to bioeconomy sectors in Poland and in the European Union,
- the share of member states in the gross value added in the EU,
- and the structure of the gross value added of bioeconomy in Poland and in the European Union,
- gross value added per 1 employee of the bioeconomy sectors in Poland compared to the EU.

The timeline of the study was 2008 and 2017. The analysis was based on data deriving from the European Commission's statistical database – Data-Modelling platform of resource economics.

3. Results and discussion

Analysing the share of respective countries in the overall employment in the bioeconomy sector in the EU, the leaders are France, Italy, Germany, Romania and Poland. Their share in the EU's employment in 2017 was, respectively, 9.2%, 10.1%, 10.7%, 12.9% and 13.4%. In the first three countries an insignificant increase of this share was noted in comparison to 2008, and the latter two showed a decrease (Figure 1). Poland ranked first for the number of bioeconomy workers and their share in the overall employment in the European Union.

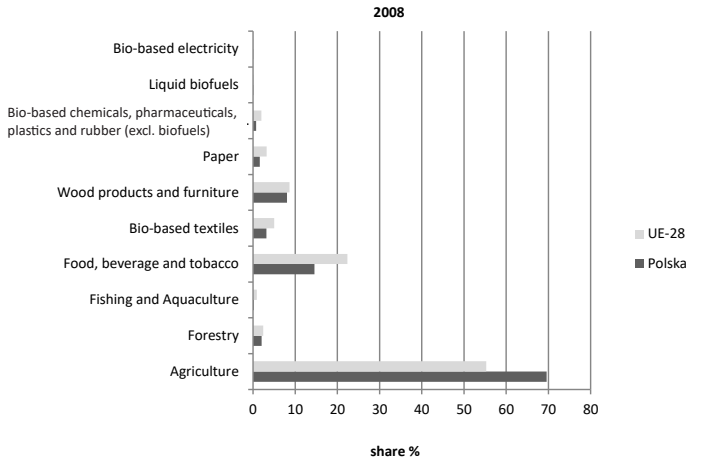
Figure 1. Share of respective member states in the total number of bioeconomy workers in EU-28 in the years 2008 and 2017 (%)



Source: own calculations based on data retrieved from JRC (2021).

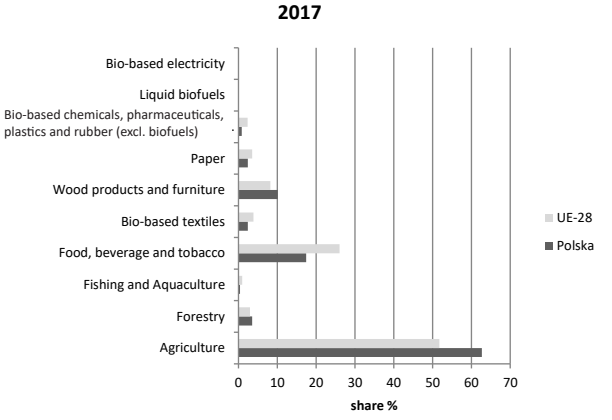
Changes in the structure of employment naturally accompany development processes. Progress of technology (measured by efficiency) and changes in the structure of consumption are among determinants of structural transformations of market-based economies (Śliwa, Waląg & Tabor, 2016). Figures 2 and 3 illustrate changes in the structure of employment in respective sectors of the bioeconomy in Poland and in the whole EU in 2017 in comparison to 2008.

Figure 2. Structure of employment according to bioeconomy sectors in Poland and in the European Union in 2008 (%)



Source: own calculations based on data retrieved from JRC (2021).

Figure 3. Structure of employment according to bioeconomy sectors in Poland and in the European Union in 2017 (%)



Source: own calculations based on data retrieved from JRC (2021).

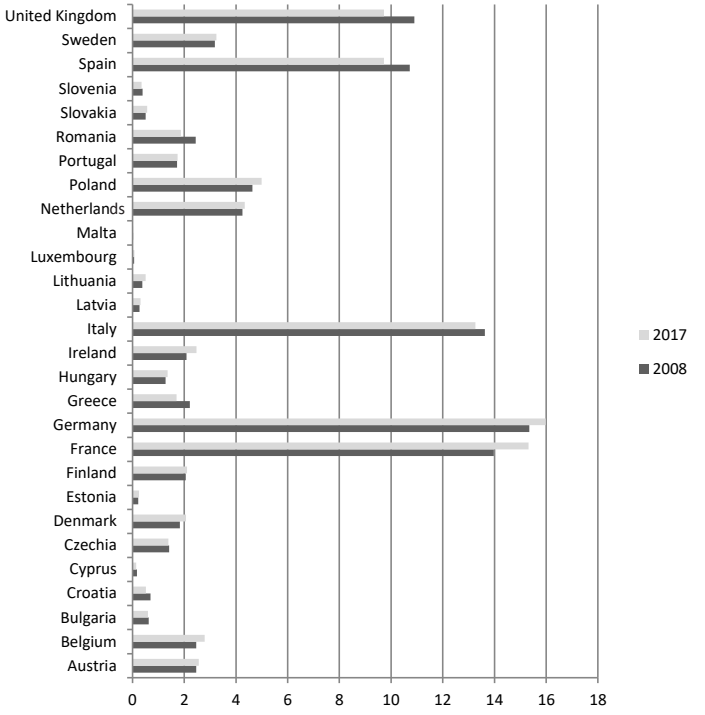
Pink and Wojnarowska (2020) underline that bioeconomy is a potential key division of the Polish economy. Considering that in 2017 bioeconomy had nearly 2.5 million employees and noted a turnover of 130.4 billion Euro, their opinion seems justified. Although the number of bioeconomy workers in 2008–2017 decreased by 18.5%, it was largely due to an outflow of agricultural workers. Analysis of changes in the structure of employment in the bioeconomy sector in Poland in the years under review implies that the share of agricultural workers decreased by nearly 7 percentage points. However, in Poland this sector remains very important for the employment market. Also Pajewski (2014) underlines that the most numerous group of bioeconomy workers is agricultural workers. He stresses that agriculture and forestry are key sectors of the bioeconomy that produce food and non-food products. A balance must therefore be found between ensuring food security for society and protecting the environment. Thus, Agriculture supplies key resources that the bioeconomy can use (Czyżewski et al., 2021). The percentage of workers in the Bio-based textiles sector also decreased (by 0.8 pp.). In the EU, next to the two above-mentioned sectors, also Wood products and furniture noted a slight decrease in the share of total employment (by 0.5 pp.) (Figures 2 and 3).

Comparing the structure of employment in the bioeconomy in Poland and in the EU the biggest disparities in employment become evident in agriculture and in the food, beverage and tobacco sector. In 2017 in Poland the latter employed 17.4% and in EU-28 slightly above 26% of all bioeconomy workers. This testifies to an unfavourable position of Poland as the processing industry generates higher added value than the primary sector, that is, agriculture (Pawlewicz & Brodziński, 2017). For agriculture the share of employment in bioeconomy sectors in Poland and in EU-28 in 2017 was 62.7% and 51.8% respectively. In both cases, Wood products and furniture was also a significant sector in terms of employment. Furthermore, when analysing changes in the structure of employment in the bioeconomy in individual Member States, it can be seen that in most of them there was a decline in employment in agriculture. In Croatia, the percentage of those employed in this sector decreased by almost 10 pp., and in Luxembourg by more than 7 pp. At the same time, there are countries such as Italy, the United Kingdom, Spain and Sweden, where the share of those employed in agriculture increased. A clear increase in the share of those employed in most Member States also occurred in the food, beverage and tobacco sector. The highest increase was observed in Croatia (by 9.2 pp.) and Malta, Cyprus, Ireland, Finland and Sweden (by over 4 pp.). Denmark is also worth mentioning, where

in the bio-based chemicals, pharmaceuticals, plastics and rubber (excl. biofuels) sector the percentage of employed increased by more than 7 percentage points.

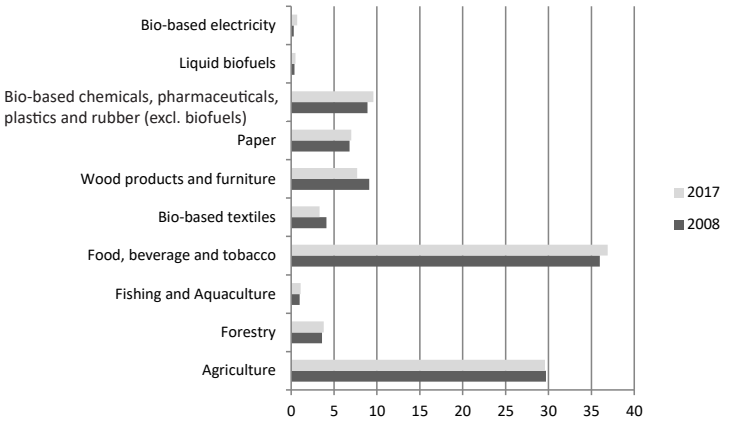
It is assumed that the share of each sector in creating gross value added and in the structure of employment testifies to the level of economic development of the country and is closely linked to its innovativeness and competitiveness (Kołodziejczak, 2018). Gross value added (GVA) is a reflection of both the production potential of accumulated and used production factors, and their market output that is possible due to effective demand (Cyrek, 2014). In 2017, bioeconomy in the EU generated GVA of 685.1 billion Euro, which implies a 20% increase in comparison to GVA in 2008. At that time, the GVA of this sector in Poland was 33.4 billion Euro and increased by 226.3% in comparison to 2008. Considering the contribution of respective countries in creating the EU GVA, the most important contributors in 2017 were Spain (9.7%), the United Kingdom (9.7%), Italy (13.3%), France (15.3%) and Germany (16%). Poland followed them with a share of 5% (Figure 4).

Figure 4. Share of member states in the gross value added of bioeconomy in the EU in 2008 and 2017 (%)



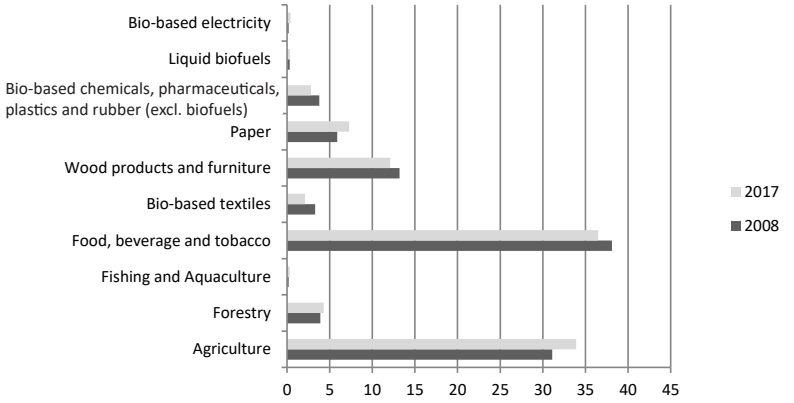
Source: own calculations based on data retrieved from JRC (2021).

Figure 5. Structure of gross value added of bioeconomy in EU-28 in 2008 and 2017 (%)



Source: own calculations based on data retrieved from JRC (2021).

Figure 6. Structure of gross value added of bioeconomy in Poland in 2008 and 2017 (%)



Source: own calculations based on data retrieved from JRC (2021).

Bas, Janakowska and Kryszak (2019) noted that the structure of bioeconomy in Poland resembles that in the countries of Western Europe. It is dominated by food production, as in 2017 this sector accounted for 36.5% of the total GVA of the bioeconomy, i.e., 1.6 percentage points less than in 2008. Agriculture also generated high added value (31.1% and 33.9%, respectively, in 2008 and 2017). In the EU this percentage was slightly lower, amounting to 29.7% in 2008

and 29.6% in 2017. This opens up favourable prospects for the development of bioeconomy to Poland. The basic factor contributing to the development of this sector is access to natural resources, and the decisive component is natural capital involving all ecosystem forms and bio-resources such as solar energy, agricultural land, water system, forests and fisheries (Woźniak, Tyczewska & Twardowski, 2021). Wood products and furniture in Poland accounted for 12.1% of gross value added generated by the bioeconomy in Poland in 2017. Compared to 2008, this percentage slightly decreased (by 1 pp.), similarly to most EU member states. Meanwhile, in countries such as Estonia, Latvia and Lithuania, the share of this sector in the structure of gross value added of the bioeconomy increased by 11.8 pp., 7.3 pp. and 4.1 percentage points respectively. Forestry in Poland shows increased significance in generating gross value added, and in 2017 represented 4.3% of GVA of the bioeconomy. Mustalahti (2018) also finds this sector significant. He emphasizes that agriculture plays an important role in generating heat and electricity as it is an important energy carrier and a main source of biomass used for producing wood pellet. Countries with a high importance of the forestry sector in GVA generation include Estonia, Slovakia, Sweden, Latvia and Finland. Forestry's share in total bioeconomy GVA ranged from 14.9% to 26.8% in these countries in 2017. In turn, Liquid biofuels, Bio-based electricity and Fishing and aquaculture were of little importance in the GVA structure of the bioeconomy in Poland as in 2017 they altogether generated only 1% of GVA of the bioeconomy in Poland and 2.3% in the EU (Figures 5 and 6). Countries where the Liquid biofuels sector had a relatively high share of bioeconomy GVA in 2017 included Finland (1.9%), Lithuania (1.2%) and Sweden (1.3%). Production resources, their quality and the efficiency of their use are among the most important factors determining the competitiveness of the economy and its sectors. Labour is one of major factors the size and efficiency of which determines the gross domestic product and household income (Mrówczyńska-Kamińska, 2012). Labour productivity is regarded as one of the most important determinants of the development of economies and sectors (Gołaś, 2019). It is used for illustrating how efficiently an economic system converts labour into an economic result (Wąsowicz, 2013). Table presents the labour productivity index for respective sectors of bioeconomy in Poland and in the EU in 2008 and 2017. This index expresses the sector-specific gross value added to sector-specific employee number ratio.

Table. Gross value added per 1 employee of the bioeconomy sectors in Poland compared to EU in 2008 and 2017

Specification	Value added per person employed (1000 Euro/person)				Dynamics (2008=100)	
	EU-28	Poland	EU-28	Poland	EU-28	Poland
	2008		2017			
Agriculture	14.66	3.86	20.83	7.25	142.1	187.8
Forestry	38.75	16.50	47.72	16.50	123.1	100.0
Fishing and Aquaculture	29.61	7.51	35.49	8.70	119.9	115.8
Food, beverage and tobacco	43.28	22.61	51.87	28.10	119.8	124.3
Bio-based textiles	23.25	9.07	32.16	12.06	138.3	133.0
Wood products and furniture	28.66	14.21	34.47	16.00	120.3	112.6
Paper	57.33	32.48	71.40	40.17	124.5	123.7
Bio-based chemicals, pharmaceuticals, plastics and rubber (excl. biofuels)	114.43	45.15	128.46	42.93	112.3	95.1
Liquid biofuels	84.09	34.29	120.02	30.58	142.7	89.2
Bio-based electricity	182.94	89.02	180.74	104.81	98.8	117.7

Source: own calculations based on data retrieved from JRC (2021).

The presented data shows that in none of the bioeconomy sectors in Poland gross value added per worker was comparable with that generated in the EU. The growth dynamics in 2017, compared to 2008, in four sectors in Poland was lower than on average in EU-28, and two sectors (Bio-based chemicals, pharmaceuticals, plastics and rubber and Liquid biofuels) noted a decrease in labour productivity. By contrast, higher growth dynamics was observed for Food, beverage and tobacco and Bio-based electricity. These sectors, next to Paper, featured labour productivity closest to the EU level. In turn, the highest difference in the value of the examined ratio compared with EU-28 was recorded for sectors such as Fishing and aquaculture, Liquid biofuels, Bio-based chemicals, pharmaceuticals, plastics and rubber, Agriculture, Forestry and Bio-based textiles. In 2017 the labour productivity levels for those sectors were 40% lower than for the respective sectors in the EU. Many authors mentioned low labour productivity in Poland. Kapela (2018), analysing the years 2000–2016, demonstrated that labour productivity in Poland was one of the lowest among member states. In turn, Mrówczyńska-Kamińska (2012) argues that in Poland very low labour productivity affects both agriculture and the whole agri-food sector. However, Tereszczuk and Mroczek (2018) showed that in 2004–2014 labour productivity improved for all sectors of the food industry in Poland. This growth was one of the fastest in EU-28. Thus, changes in labour productivity derive from both general and sector-specific economic processes.

Conclusions

The evolution of the management paradigm focuses on global challenges the present-day society must face. These include food security, increasing consumption of natural resources and climate change. A management concept capable of meeting these challenges is the bioeconomy development strategy. Its idea is to continue pursuing previous economic objectives, at the same time reducing the consumption of natural resources and a negative impact on the environment employing new technological solutions. Such an understanding of bioeconomy is represented by strategy documents and development programmes of respective member states of the European Union. In Poland the concept of bioeconomy has become an area of strategic planning, notably in the field of innovation, and – as a result – is regarded a smart specialization in the regions of Poland.

Our surveys show that in 2017 Poland ranked first in the EU in terms of the number of bioeconomy workers. However, differences in the structure of employment could be observed between Poland and the whole EU. They mostly refer to a higher share of employment in Polish agriculture, with a lower percentage of workers in the food, beverage and tobacco sector. In addition, Poland had a 5% share in generating gross value added (GVA) of the EU's bioeconomy, which put it fifth among all the member states. The GVA structure of bioeconomy in Poland was similar to that in the EU. The dominant sectors are Food, beverage and tobacco and Agriculture, while Bio-based electricity and Bio-fuels are the least important.

It is worth noting the clear disproportion between Poland's share of total bioeconomy employment in the EU and its share of EU GVA in the sector. In 2017, Poland had a 13.4% share in total EU bioeconomy employment and its share in EU GVA was only 5%. Research also shows that labour productivity in respective bioeconomy sectors in Poland is much lower than on average in EU-28. Considering the fact that labour productivity is a basic measure of competitiveness, ways to improve its levels in the bioeconomy of Poland should be sought. The opportunity for its growth lies in boosting structural transformation and improving the innovativeness of certain sectors, thanks to the effective use of EU funds, particularly in the agricultural sector.

Many factors, including sectoral policies, and in particular those related to agriculture, fishing, forest management, environmental protection, energy but also science and innovation, contribute to the development of bioeconomy. Internal factors in respective countries also play an important role as they determine efficient use of the bioeconomy potential and enhance the competitiveness of

bioeconomy. Therefore, the present studies should be regarded preliminary, and the next stage of research should involve determining the competitive position of the Polish bioeconomy in the European Union based on international trade ratios.

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Summary

Bioeconomy has become one of the major directions in the development of the European Union (EU). This is a response to global challenges including sustainable management of natural resources, sustainable production, public health improvement, mitigation of adverse effects of climate change, and integrated social and economic development. This article aimed to describe how bioeconomy develops and how significant it is to the European Union and evaluate the potential of bioeconomy in Poland in comparison to other EU member states. The potential of bioeconomy was analysed according to the level and structure of employment, gross value added generated by this sector of the economy, as well as according to labour productivity. The analysis was based on an official classification of economic activity in Europe (NACE). The timeline of the study was 2008 and 2017, which allowed evaluating changes that occurred over a decade. The analysis involved data deriving from the European Commission's statistical database. The studies imply that in 2017 Poland ranked first in the EU in terms of the number of bioeconomy workers, whereas differences in the structure of employment could be observed between Poland and the whole EU. They mostly referred to a higher share of employment in Polish agriculture, with a lower percentage of employment in the food, beverage and tobacco sector. In addition, Poland had a 5% share in generating the Gross Value Added (GVA) of the EU bioeconomy, which put it fifth among all the member

states. The GVA of bioeconomy in Poland had a structure similar to that presented by the whole EU with Food, beverage and tobacco and Agriculture being the most significant sectors and Bio-based electricity and Liquid biofuels being relatively insignificant. In addition, in all the sectors labour productivity was lower than on average in the EU.

Keywords: bioeconomy, potential, European Union, Poland

Streszczenie

Biogospodarka staje się obecnie jednym z najważniejszych kierunków rozwoju Unii Europejskiej. Jest ona odpowiedzią na globalne wyzwania, do których zaliczyć można zrównoważone zarządzanie zasobami naturalnymi, zrównoważoną produkcję, poprawę zdrowia publicznego, łagodzenie niekorzystnych skutków zmian klimatycznych oraz integrowanie rozwoju społecznego i gospodarczego. Celem opracowania było określenie istoty i znaczenia rozwoju biogospodarki dla Unii Europejskiej oraz ocena potencjału biogospodarki Polski na tle krajów UE. Potencjał biogospodarki analizowano na podstawie poziomu i struktury zatrudnienia oraz wartości dodanej brutto wytwarzanej przez ten dział gospodarki. Opierano się na oficjalnej klasyfikacji sektorów działalności gospodarczej w Europie (NACE). Zakres czasowy badań obejmował lata 2008 i 2017, co pozwoliło na ocenę zmian, jakie nastąpiły w dziesięcioletnim okresie. Analiza przeprowadzona została na podstawie danych pozyskanych z platformy danych statystycznych Komisji Europejskiej. Z przeprowadzonych badań wynika, że w 2017 r. Polska zajmowała pierwsze miejsce w UE pod względem liczby osób zatrudnionych w biogospodarce, przy czym można zaobserwować różnice w strukturze zatrudnienia pomiędzy Polską i UE ogółem. Dotyczą one przede wszystkim wyższego udziału zatrudnienia w polskim rolnictwie, przy niższym odsetku pracujących w sektorze produkcji żywności, napojów i tytoniu. Polska ponadto posiadała 5% udział w tworzeniu unijnej wartości dodanej brutto biogospodarki, co sytuowało ją na 5. miejscu wśród krajów członkowskich. Struktura WDB biogospodarki w Polsce była podobna do tej, jaka występowała w skali całej UE, bowiem największe znaczenie odgrywały w niej sektory producentów żywności, napojów i tytoniu oraz rolnictwa, natomiast stosunkowo niewielkie znaczenie miały sektory producentów bioenergii i biopaliw płynnych.

Słowa kluczowe: biogospodarka, potencjał, Unia Europejska, Polska

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