POLAND
COMPETITIVENESS REPORT
2024

Edited by
Arkadiusz Michał Kowalski
Marzenna Anna Weresa

The Role of Public Health in Creating Competitive Advantages

SGH Publishing House

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Preface

Marzenna Anna Weresa, Arkadiusz Michał Kowalski

Global shocks to the world economy, such as the COVID-19 pandemic, the war in Ukraine, and the Israeli–Palestinian conflict, as well as local shocks, including natural disasters – floods, hurricanes – cause changes in economic conditions. Disruptions in global value chains induced by external shocks, as well as increasing competition from emerging economies, translate into the intensity and direction of international trade and foreign direct investment flows. Many economies, especially highly developed ones, struggle with unfavourable demographic trends and problems related to population migration. Environmental degradation and climate change pose a growing challenge.

In the face of new challenges and high-risk and uncertainty, the question arises as to the adequacy of the concept of competitiveness to explain why some countries are raising their welfare levels and improving their citizens' quality of life faster than others. Does the research on competitiveness undertaken to date provide an answer to this question? Which elements that combine to form the competitiveness of economies have not been comprehensively analysed yet and require further exploration and in-depth study? In the context of the negative effects of the COVID-19 pandemic, health is an important area of focus for societies, especially scientists, entrepreneurs and politicians. The concept of competitiveness links health to welfare and quality of life, but studies devoted directly to this topic in the context of the competitiveness of economies are scarce. Health is mostly conceived as a component of human capital and is considered in this broader dimension, combined with education, in research on competitiveness. For this reason, in this monograph we address health from a narrower perspective, as a factor of competitiveness, and also include in the analysis other more subjective health-related elements that so far have appeared marginally in studies on the competitiveness of economies, such as happiness and well-being. A related category is the concept of public health, which was defined by Winslow [1920] as "the science and the art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard

of living adequate for the maintenance of health". This definition has guided health policy efforts both nationally and internationally for many years. Currently, one of the most popular is Acheson [1988] definition, according to which public health is "the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society".

The aim of this monograph is to determine the competitiveness of the Polish economy compared to other EU countries, and to determine whether Poland is competitive in the area of health. In line with the pattern adopted in previous editions of this series of monographs published by the World Economy Research Institute of the SGH Warsaw School of Economics on the competitiveness of the Polish economy, the analysis is conducted from two perspectives: that of competitive ability and that of competitive position. Competitive ability encompasses the resources and skills needed to build competitive advantages in order to increase welfare and quality of life. Competitive position, in turn, reflects a country's performance resulting from the use of its own and foreign resources, productive capacities and institutions, and the benefits of participation in the international division of labour.

The monograph is composed of two parts organised into chapters, and a synthetic summary. Part I, which consists of six chapters, discusses the basic concepts of competitiveness and its determinants in the context of welfare, health, well-being, and the economics of happiness. Using introductory theoretical considerations (Chapter 1) as a starting point for the analyses, the competitive position of the Polish economy is presented with a focus on the critical aspects of public health. The income-related aspect of competitiveness is illustrated by the discussion of income convergence across the European Union, which is summarised in the presentation of the 'pentagon of competitiveness' based on key macroeconomic indicators (Chapter 2). Another theme of the analyses is the healthcare infrastructure in Poland, including selected aspects of foreign cooperation in health-related sectors (Chapters 3–5). A comprehensive account of Poland's competitive position from a macroeconomic perspective is provided by the results of the survey on total factor productivity based on growth accounting (Chapter 6), which are the final contribution to Part I.

Part II of the monograph (Chapters 7–11) looks at Poland's competitive capacity compared to other EU countries and the factors involved, with a particular emphasis on aspects related to public health. The analysis opens with an identification of the capital (Chapter 7) and labour resources available in the Polish economy, taking into account the qualifications of the workforce and the well-being of employees (Chapter 8). This is followed by an in-depth study of innovation in Polish health-related industries and clusters (Chapter 9), including the state of digital transformation of health (Chapter 10) and the cultural determinants of public health (Chapter 11).

The studies are rounded off with a summary that presents the most important theoretical and empirical findings and offers conclusions. This year's monograph on the competitiveness of the Polish economy contributes to the research on new themes that can be explored in this field, and is an input into the discussion on health and its role in driving the competitiveness of economies.

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Part I

Poland's Competitive Position in the European Union: The Role of Public Health

Chapter 1

Health, Well-Being, the Economics of Happiness and Competitiveness of the Economy

Marzenna Anna Weresa, Arkadiusz Michał Kowalski, Adrian Zwoliński

1.1. Introduction

The ongoing changes in the business environment and international cooperation associated with the technological revolution and other external shocks, such as the COVID-19 pandemic, and the challenges posed by ageing populations in developed countries as well as environmental degradation, have implications for how the concept of competitiveness of economies is defined. An important vein in the scholarly discussion on this topic was the focus on those aspects of competitiveness that go beyond economic growth and the ability to compete in international markets. In the contemporary definitions, reference was made to elements such as increasing the welfare of society and deriving benefits from the social division of labour [Siebert, 2006; Misala, 2007, 2014; Delgado, Ketels, Porter, Stern, 2012; Aiginger, Vogel, 2015]. New concepts have been introduced in literature, such as foundational competitiveness [Delgado et al., 2012], sustainable competitiveness, institutional competitiveness, and relational competitiveness [Kowalski, Weresa, 2022; Weresa, 2023]. Competitiveness concept that includes welfare and quality of life aspects can be approached even more broadly by referring to the economics of happiness. This is a new vein that corresponds to the main theme of this monograph, which is health as a factor affecting the competitiveness of economies.

Accordingly, the aim of this chapter is to establish the links between competitiveness and issues of welfare and happiness, and to identify the importance of health as an element of human capital in shaping the competitiveness of economies.

1.2. International competitiveness, with particular reference to the sustainability dimension

The concept of competitiveness has been formulated in literature since the mid-twentieth century, with attempts being made at that time to define this complex phenomenon. Narrowing the focus down to macroeconomic competitiveness, one can see a certain evolution of the concept of competitiveness, from simple definitions focusing on international trade as the main indicator of a country's success in the international environment [Balassa, 1965], to a broad approach describing competitiveness as a country's ability to create welfare. It was recognised as early as in the 1990s that competitiveness is closely linked to welfare and quality of life [Tyson, 1992]. Oughton and Whittam [1996] supplemented the definition of competitiveness by emphasising that improving a country's competitiveness is linked not only to an increase in productivity, but also to achieving a higher standard of living while maintaining an increase in the employment rate. As an indicator of competitiveness, welfare is also included in the definitions by other researchers of this phenomenon [Bossak, 2000; Siebert, 2006; Delgado et al., 2012; Misala, 2007, 2014]. Aiginger and Vogel [2015] proposed an even broader approach by defining competitiveness as a country's ability to create welfare and achieve other goals beyond GDP growth.

From the point of view of the analysis of health in the context of competitiveness, it seems most appropriate to refer to the definition of sustainable competitiveness and its social and environmental aspects, which emphasises that public health is one of the elements relevant to the assessment of competitiveness [Corrigan, Crotti, Drzeniek Hanouz, Serin, 2014]. Sustainable competitiveness involves resources as well as institutions and policies that determine productivity growth while ensuring social and environmental sustainability [Blanke, Crotti, Drzeneik-Hanouz, Fidanza, Geiger, 2011; Corrigan et al., 2014; Kowalski, Weresa, 2022]. Social sustainability as a component of competitiveness encompasses respect for human rights, social justice, including the reduction of inequalities, and elements affecting health, such as access to drinking water, hygiene and access to healthcare. Public health is also to some extent the result of the sustainable use of the environment, as environmental pollution is harmful to public health in the long term. All of these components of the sustainable dimension of competitiveness are linked to labour productivity and the economy's ability to compete in the global market [Corrigan et al., 2014, pp. 58–59].

Table 1.1 summarises these definitions of the competitiveness of economies that broadly capture this concept, referring to welfare, improvements in citizens' living standards, and social and environmental factors, including public health. While

the concept of competitiveness is gradually evolving, most definitions highlight the productive use of resources available domestically and the ability to attract foreign resources, emphasising the international dimension of the competitiveness of economies, which is determined by comparison to other countries. Welfare as a manifestation of competitiveness appears in definitions that were established in the last decade of the twentieth century, but in the twenty-first century, various aspects of environmental and social sustainability, including health [Corrigan et al., 2014] and relational capital and its impact on both economic and social activities [Kowalski, Weresa, 2021], have additionally begun to be taken into account. Recent research further expands this definition by emphasising the role of state policy in laying the foundations for welfare, including health and pro-environmental development [Kirjavainen, Saukkonen, 2020].

Table 1.1. Overview of these definitions of competitiveness that refer to welfare, quality of life and social and environmental factors (including health)

Author	Definition	Key aspects
Tyson [1992]	the ability to produce goods and services that prove successful in the international market, with its citizens achieving a sustained improvement in their standard of living	exports, welfare
Oughton, Whittam [1996]	the ability to sustain productivity growth and improve the living standards of the population over the long term while maintaining an increase in the employment rate	welfare, productivity, employment
Aiginger [1998, 2006]	the ability to sell goods and services and ensure external sustainability; the ability to generate income from production inputs in line with changing national aspirations; macroeconomic, environmental and social conditions that are attractive to business and the population	exports, external sustainability, attractiveness of location, attractiveness of environmental and social conditions
Bossak [2000]	institutional, macroeconomic conditions and the efficiency of the market mechanism to guarantee the dynamic development of the country and enterprises in a volatile environment	institutions, attractiveness of location, welfare
Siebert [2006]	the ability to improve welfare by leveraging its own production inputs and ensuring attractiveness to foreign inputs	welfare, attractiveness of location
Delgado et al. [2012]	welfare based on the ability to both achieve high productivity and mobilise the available labour force, measured as the expected output per person in working age, taking into account the attractiveness of the country as a business location	welfare, productivity, employment, attractiveness of location
Misala [2007, 2014]	the ability of economic operators to sell products in international markets or to attract highly productive resources leading to greater benefits from the social division of labour than those achieved by partners to increase income and improve the satisfaction of needs	exports, attractiveness of location, welfare
Corrigan et al. [2014]	institutions and policies that increase the productivity of domestic resources while ensuring social and environmental sustainability	institutions, policies, productivity, sustainability

cont. Table 1.1

Author	Definition	Key aspects
Aiginger, Vogel [2015]	the ability of a country (region, location) to create welfare and specifically to achieve goals beyond GDP growth	welfare, quality of life
Kirjavainen, Saukkonen [2020]	the effectiveness of the nations' social and economic policies in achieving the relevant results or targets of competitiveness policies (such as productivity, social and environmental factors) using available inputs (e.g., technology, education and health)	socio-economic policies, sustainability
Kowalski, Weresa [2021]	the ability to improve productivity through the use of relational capital resources and the ability to create new relations to provide a stable framework for multidimensional cooperation in all areas of social and economic activity	productivity, relational capital, cooperation

Source: own elaboration based on the literature cited.

1.3. Competitiveness vs. well-being and the economics of happiness

The concept of happiness is difficult to describe concisely, especially in view of the vagueness of this concept. Among various approaches to happiness, one can point to both normative and subjectivist theories, where the former assume the existence of an external model whose pursuit is deemed as the pursuit of happiness, while in the latter, "[t]he concept of happiness is identified here with a sense of satisfaction with one's fortune and the balance of emotional experiences" [Czapiński, 2017, p. 18]. The problems associated with this concept are multiple, for example: if one points to particular elements of happiness such as the experience of joy, contentment and the feeling of a good, meaningful, valuable life [Wojciszke, 2022, p. 250], this, in turn, raises the question of how they are understood. One can also point, for example, to the problem of the contradiction between one's goals and the impossibility of satisfying one's desires at the same time, which casts a shadow over the possibility to empirically investigate the principles behind happiness [White, 2008, pp. 141–142]. The limitations and controversies concerning happiness should be kept in mind in the context of the application of the concept to macroeconomic topics.

Alongside the concept of happiness, there is also the concept of subjective well-being. One approach presented in literature indicates that there are three elements to well-being: life satisfaction (overall subjective evaluation), positive feelings, such as happiness, joy, and vitality, and the absence of negative feelings such as anger [Diener, 1984; following Stiglitz, Sen, Fitoussi, 2009, p. 146].

Undoubtedly, the concept of happiness is linked to a favourable – from a given perspective – human position or condition regardless of the intensity or timing of the experience of happiness. Especially in a broad approach that emphasises the ideal of

happiness – a definition that Tatarkiewicz pointed out as "full and lasting satisfaction with life as a whole" [2015, p. 31] – happiness can give the impression of a *primus inter pares* value, consuming minor aspects of life, such as economic aspects related to issues such as work, prices, income, usefulness and availability of goods. What higher or more comprehensive goal of the economy and effect of management is there than happy people? This is one of the reasons why happiness can appear attractive from the perspective of both economics and economic policies. In terms of the competitiveness of the economy, happiness can be analysed from the perspective of both the competitive capacity of the economy and the competitive position.

Competitive capacity encompasses resources and skills that increase the welfare of society, leading to the division of competitive capacity into two spheres: real (e.g., domestic and foreign resources) and institutional (for example, the value system) [Weresa, 2023, p. 15]. Considering happiness as subjective [Wojciszke, 2022, p. 250] and elaborating on the aforementioned division of competitive capacity, happiness shapes human resources in qualitative terms (people in the role of employees), thus having an impact on the real sphere; it originates, however, in the area of experiences, emotions and values, and is thus an area related to the institutional sphere. This understanding of happiness – based on the research indicated – can be presumed to have a positive impact on human productivity [Oswald, Proto, Sgroi, 2015; Bellet, De Neve, Ward, 2019]. On the other hand, there are premises for the view that happiness (good mood) can also negatively affect cooperation [Proto, Sgroi, Nazneen, 2017]. The impact of happiness on humans can be described as multidimensional, and still requires in-depth research, despite the available literature.[1]

Competitive position is an outcome-focused approach, and relates for instance to the level of development of the economy and its sustainability, or the economy's role in the international division of labour, with the outcome being the result of the interaction between the state and companies [Weresa, 2023, p. 15]. From perspective of competitive position, happiness can be understood as an outcome of the socio-economic processes that occur in the economy. A farther-reaching (albeit not without controversy) approach could present it perhaps even as a kind of 'meta-indicator' of competitiveness. In addition, it should be noted, that happiness in the context of

[1] The relationship between competitiveness, productivity and well-being (happiness) is also pointed out by Runiewicz-Wardyn [2018, p. 4]: "Finally, competitiveness, especially in the long-term, is the ability to turn the economic prosperity into the broader measures of the country's well-being. The social well-being is also an important driver of productivity. Studies examining the relationship between productivity and well-being suggest that happier people are more productive [Boehm, Lyubomirsky, 2008; Oswald et al., 2015]. And vice versa higher productivity and a strong international competitiveness enable improvements in the investments into living standards such as health, education, transport infrastructure and other areas, which further on improve the competitiveness".

competitiveness, as one of the possible approaches, was mentioned by the authors Aiginger, Bärenthaler-Sieber and Vogel [2013, p. 11] who pointed out happiness in the area of "outcome competitiveness" within the "new perspectives".

Addressing the topic of happiness from the perspective of a competitive position is highly dependent on the problem already raised, which is the essence of the concept of 'happiness', as well as on the construction of indices that attempt to measure happiness. For example, the Happy Planet Index is defined as "a measure of sustainable well-being, ranking countries by how efficiently they deliver long, happy lives using our limited environmental resources" [Hot or Cool Institute, 2023b]. It consists of the indicators of life expectancy, satisfaction with life and ecological footprint, understood in the way chosen by the authors, and according to these criteria the top three places in the 2019 Happy Planet Index are taken by Costa Rica, Vanuatu, and Colombia, in that order [Hot or Cool Institute, 2023a].

One element of the debate on happiness is its determinants. Without referring to the extensive literature on the subject, this can be adjudged as a complex issue: different things (e.g., areas of life or events) can to different degrees, for different reasons, under different conditions and for different people be a factor in the formation of happiness. Against this background, health is a major determinant – as Szubert [2019, p. 89] points out: "(…) the relationship between health and sense of happiness is one of the best documented in empirical research. Sometimes it is even recognised that health is one of the components of happiness in the broadest sense (…). Health is an important and objective aspect of overall well-being. It is commonly regarded as one of the main causes of happiness". Given the importance of the health factor, it needs to be analysed in the context of competitiveness.

1.4. Public health as a factor of competitiveness and well-being

In analysing the issue of public health from the perspective of international competitiveness, it is critical to place particular emphasis on health in relation to its impact on human capital development, both qualitatively and quantitatively. In this context, human capital can be defined as "the body of knowledge, skills, health and vital energy held within a given population, nation. Human capital is a resource that generates future satisfaction, earnings or, generally speaking, services of some value" [Domański, 1998, p. 67]. Health was included as one of the factors of human capital by Blaug [1976], and the theoretical basis for viewing health as an integral part of human capital was formulated/created by Grossman [1972], who developed a model

of demand for a product/commodity called 'good health'. In this approach, health is a permanent capital resource that depreciates in value as a function of time, but strategic investment in the health sector can restore or augment it.

At the microeconomic level, the health of individuals has a bearing on their ability to develop personally and achieve financial stability. Combined with education, it affects the productivity of employees. At the same time, health affects the development of individual aspirations in various fields, covering the economic, social and professional spheres, thus leading to higher economic activity of the population and entrepreneurship. At the meso- and macroeconomic level, health has a positive impact on the competitiveness of economies, as it serves to improve the quality of work and increase the productivity of the workforce in various industries and sectors of the economy. At the same time, the allocation of resources to preserve and improve health is now recognised as an investment in civilisational development and human capital, as public health is one of the most important factors for economic growth and social development [Frączkiewicz-Wronka, 2021].

The analysis of public health as one element of human capital and a competitiveness factor leads well-being to be conceived as a key economic, health and social category, covering the most important aspects of an individual's functioning at economic, health, social and psychological levels. Well-being is therefore that fundamental product/commodity that determines the quality of life and the capacity for collective social and economic action [Mirski, 2009]. According to the OECD [2001], human capital comprises knowledge, skills, abilities and other characteristics embodied in an individual that facilitate the creation of personal, social and economic well-being. Research on well-being in human capital management uses a three-dimensional model [Van De Voorde, Paauwe, Van Veldhoven, 2012], and these elements are well-being in terms of health, well-being in terms of subjective well-being, and relational (social) well-being – the quality of the employee's interpersonal relationships [Guest, 2017]. At the same time, there is a positive correlation between well-being and employee engagement [e.g., Gupta, Shaheen, 2018]. This means that there is a positive correlation between welfare and labour productivity, which helps to increase international competitiveness.

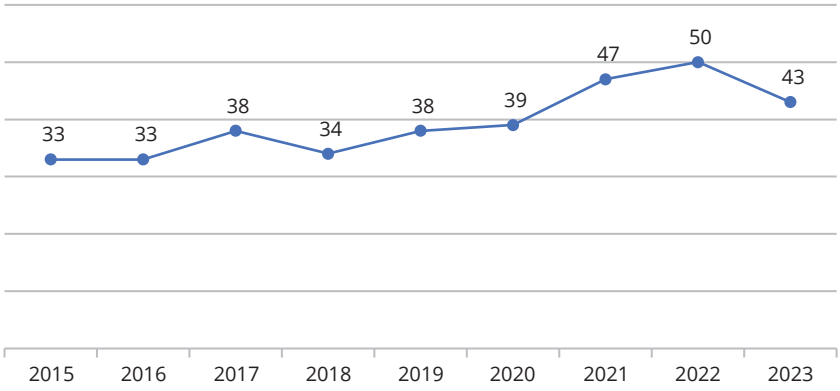
1.5. Poland's position in terms of competitiveness, satisfaction with life/happiness and level of health

The starting point for the analysis of Poland's position in terms of satisfaction with life/happiness and level of health is a description of the overall level of competitiveness of the Polish economy based on data from the *World Competitiveness Yearbook* survey

conducted by the International Institute for Management Development (IMD), based in Lausanne, Switzerland. The strength of the research method used is the combination of statistical data (two thirds) and survey data (one thirds) obtained through an exclusive survey of executives in each of the 66 countries analysed.

An active participant in the annual research for the *World Competitiveness Yearbook* is the World Economy Research Institute of the SGH Warsaw School of Economics, which is responsible for collecting statistical data on Poland. Poland's ranking according to statistics in the *World Competitiveness Yearbook* for the period 2015–2023 is shown in Figure 1.1.

Figure 1.1. Poland's position in the *World Competitiveness Yearbook* ranking in 2015–2023 (vs. 64 countries analysed)



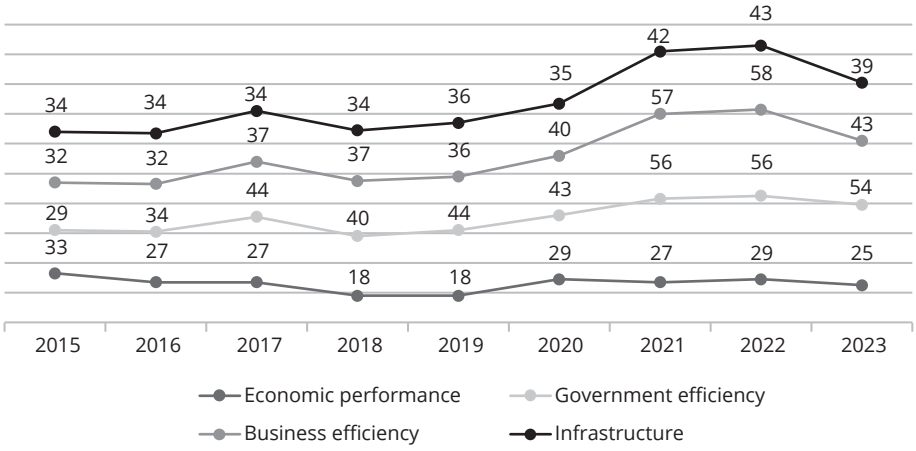
Source: own elaboration based on IMD data.

In the analysed period 2015–2023, Poland fell in the overall *World Competitiveness Yearbook* ranking from 33rd place in 2015 to 43rd place in 2023. At the same time, the report enables an in-depth analysis of the determinants of competitiveness of the economies surveyed, as it includes data on a wide range of economic aspects that make up the four main factors, which are:

1) economic performance,
2) government efficiency,
3) business efficiency,
4) infrastructure.

Figure 1.2 shows Poland's position in each area of the *World Competitiveness Yearbook* ranking in 2015–2023.

Figure 1.2. Poland's position in each area of the *World Competitiveness Yearbook* ranking in 2015–2023



Source: own elaboration based on IMD data.

The analysed period 2015–2023 saw significant variability in Poland's position in individual areas of the *World Competitiveness Yearbook* ranking. While at the beginning of the period surveyed, in 2015, Poland was ranked 29th for 'Government efficiency', at the end of that period, in 2023, it fell to 54th place in this category. Poland's position in terms of business efficiency (down from 32nd to 43rd place) and infrastructure (down from 34th to 39th place) has also deteriorated. By contrast, Poland's place in the economic performance category improved, from 33rd place in 2015 to 25th place in 2023.

Based on the report [IMD, 2023], the most important challenges to Poland's competitiveness were identified as:

- making green and digital transformation of industries and businesses a priority,
- reducing regulatory barriers to the use of digital technologies in the economy,
- facilitating public-private cooperation for the effective upgrading of employee skills,
- improving the integration of refugees into the labour market,
- increasing energy efficiency and developing renewable energy sources.

In the face of these challenges, the question arises of society's motivation to act to improve competitiveness. Following on from the reflection in the previous sections, it is worth looking at Poland's position in rankings which measure the level of happiness of societies. *The World Happiness Report* was first presented in 2012 and has been published every year since 2015. One of the recurring elements of this publication is the *Ranking of Happiness*, which ranks countries in the life evaluation category. The average life evaluation score of the last three years relative to the year of publication of the report is used and based on the Gallup World Poll [Helliwell, Huang, Norton,

Goff, Wang, 2023a, p. 32]. The study uses the so-called 'Cantril ladder'.[2] The issue assessed is "current life as a whole" [Helliwell et al., 2023a, p. 32]. Referring back to the concept of happiness discussed earlier in this chapter, on the basis of this ranking, it is a subjective as well as temporally broad (oriented towards the past and the present) and thematically comprehensive (considering quality of life in general) approach corresponding to satisfaction with life.

In order to determine changes in Poland's position, the *World Happiness Report 2018*, covering the *Ranking of Happiness* for 2015–2017, and the *World Happiness Report 2023*, covering the *Ranking of Happiness* for 2020–2022, were used for comparison. The comparison is all the more interesting as it points to two periods in Poland's history: the first (2015–2017) – relatively stable in terms of both the international situation and the economic situation, and the second (2020–2022) – relatively unstable, both in terms of the international situation and the economic situation, as it includes both the COVID-19 pandemic and Russia's invasion of Ukraine. The country that came first place in both rankings was Finland, with a score of 7.632 in the period 2015–2017 and a score of 7.804 in the period 2020–2022 [Helliwell et al., 2023a, p. 34; Helliwell, Helliwell, Huang, Wang, Shiplett, 2018, p. 20]. In the 2015–2017 ranking, Poland ranked 42nd out of 156 countries, with a score of 6.123 [Helliwell et al., 2018, p. 20], while in the 2020–2022 ranking Poland ranked 39th out of 137 countries with a score of 6.260 [Helliwell et al., 2023a, p. 34]. This indicates a slight increase in the life evaluation score, i.e., a positive trend, between these periods.

Focusing on the social and environmental aspects of competitiveness, Poland's position can be analysed using the Social Progress Index (SPI). The three components of this index describe a country's advancement in terms of [Harmacek, Krylova, 2023, p. 5]:

1) satisfaction of basic human needs,
2) foundations of well-being, and
3) opportunity for personal development.

These are non-economic aspects of development that do not relate to the rate of economic growth or to GDP per capita. An analysis of changes in the SPI values for Poland in 2015–2023 reveals that after a gradual increase, it fell from 80.69 to 80.17, and Poland ranked below the EU average, which was 85.3 in 2022.[3] While in terms of the SPI, Poland ranked 39th out of 169 countries analysed in 2022, it ranked slightly

[2] Interviewees are asked the question: "Please imagine a ladder, with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?" [Helliwell, Huang, Norton, Goff, Wang, 2023b, p. 1].

[3] The SPI and its components are on a range of 1–100.

higher, i.e., 36th, in terms of GDP per capita [SPI, 2023]. This result indicates that Poland's position in social and environmental aspects of development is relatively lower compared to the position determined by economic factors. In 2015, the situation was the opposite, with social and environmental aspects placing Poland higher in the ranking than the economic development measured by GDP per capita.

The SPI components that relate to the area of health are a group of indicators defined as 'health and wellness'.

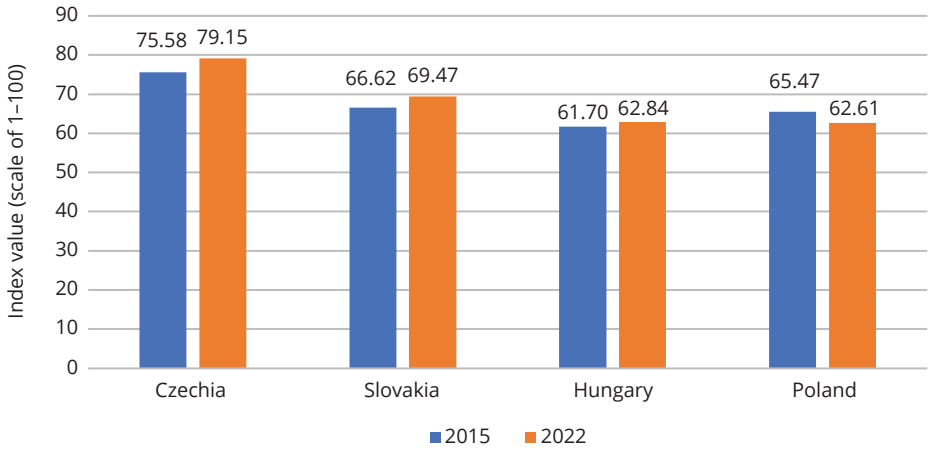
The 'health and wellness' area is made up of the following five sub-indicators:

- equal access to quality healthcare for all citizens (measured on a scale of 1–4, where: 0 – unequal, 4 – equal),
- life expectancy at 60 (years),
- premature deaths from non-communicable diseases (deaths per 100 thousand),
- access to essential healthcare services (measured on a scale of 0–4, where: 0 – none; 100 – full coverage),
- satisfaction with the availability of quality healthcare (percentage of population).

Poland performs similarly to its peers on four out of five the above mentioned indicators. It ranks significantly worse than this group of countries in terms of the population's satisfaction with the availability of quality healthcare, which translates into an overall indicator for the 'health and wellness' area that is below the group average.

An analysis of changes in the whole 'health and wellness' area over the period 2015–2022 shows that Poland's position has weakened, moving from 49th to 63rd place, with the value of the index falling from 65.47 to 62.61.

Figure 1.3. Poland's position in the 'health and wellness' area compared to other V4 countries in 2015 and 2022

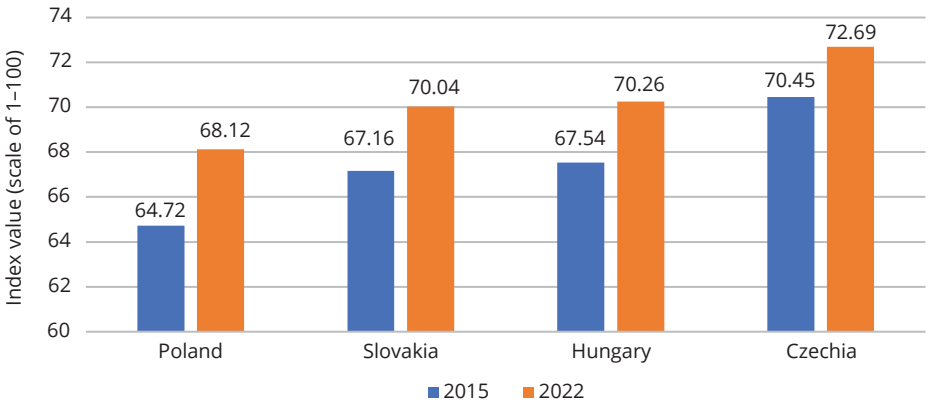


Source: SPI [2023].

If the comparison is limited to the V4 countries, the picture becomes even more pessimistic. Poland's performance is the lowest, and it is the only country in this group to record a worse position in 2022 compared to 2015 (Figure 1.3). This is not a good prospect for the future as far as the health of the Polish population is concerned.

As indicated in the first part of the chapter, the second pillar of sustainable competitiveness that affects health in the long term is ecology, captured in the SPI as the 'environmental quality' area. Figure 1.4 shows Poland's position in this respect and how it has changed since 2015.

Figure 1.4. Poland's position in the 'environmental quality' area compared to other V4 countries in 2015 and 2022



Source: SPI [2023].

The conclusions that can be drawn from the analysis of the data are ambivalent. On the one hand, on the positive side for Poland, a significant improvement in the 'environmental quality' indicator over the period 2015–2022 should be noted. On the other hand however, even with the improvement in the indicator, Poland is still the worst performer in terms of the 'environmental quality' among the V4 countries.

1.6. Conclusions

In response to new challenges, both global and local, and the paradigm shifts in governance resulting from the fourth industrial revolution and environmental threats, competitiveness needs to be examined from a different, previously unexplored angle. Recognising that human beings are at the centre of every action, it is worth considering what influences their motivations to perform their various roles as entrepreneurs,

producers, consumers, innovators, and citizens. This chapter contributes to such a discussion by considering a non-traditional perspective on competitiveness. Our focus is on welfare, happiness, and health, which are supposed to contribute to welfare (or more broadly, well-being).

Happiness can be analysed from the perspective of both the competitive capacity and the competitive position. At the same time, the attractiveness of this category describing a favourable human situation is limited with some examples given above (e.g., the vagueness of the concept of 'happiness'). When viewing happiness as a competitive capacity, it is important to bear in mind its impact on people, e.g., employees, and how happiness forms human capital, relationships or professional activities. The competitive position aspects, in turn, are reflected in the indices and rankings. Their structure is crucial, as it shapes the scope of the concept of happiness (or concepts close to it) or the context in which happiness is presented, and thus indicates those outcomes that arise from competition.

One of the factors influencing the subjective sense of happiness is health, which, combined with education, is a component of human capital and influences the productivity of the workforce and, consequently, international competitiveness. The analysis of public health as one element of human capital and a competitiveness factor leads, in turn, to the concept of well-being as a category which integrates economic, health, and social perspectives. The positive correlation between well-being and employee engagement in economic activity can translate into improvements in labour productivity and thus into increased well-being and quality of life, which are manifestations of international competitiveness.

Summarising the analysis of Poland's position in various rankings of competitiveness and satisfaction with life or happiness, and in terms of more specific indicators of sustainable competitiveness related to health and ecology, one can see a downward trend in Poland's overall competitive position in the 2015–2023 period. In the short term, however, from the perspective of 2023 only, there is a slight improvement in competitiveness compared to the previous year. Indicators reflecting the happiness of the Polish population have also slightly improved. No such improvement has unfortunately been recorded in the area of health; on the contrary, after a period of some fluctuations in the 'health and wellness' area indicator, there has been a decline, ranking Poland last in this respect among the V4 countries. Poland also ranks lowest among the V4 countries in terms of indicators describing the area of sustainable competitiveness defined as 'environmental quality'. However, a positive trend is the gradual improvement of this indicator over the period 2015–2022.

The analysis of the changes in Poland's position in the various rankings presented above is firstly intended to show a general, preliminary picture of competitiveness,

especially in the area of health. Secondly, showcasing changes in economic and social performance can catalyse improvements and motivate action, and suggest desirable directions for competitiveness policy interventions. However, it is difficult to draw definitive conclusions on the impact of health on the competitiveness of the Polish economy on the basis of these preliminary analyses. A more detailed picture of these relationships is provided in the following chapters.

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Chapter 2

Income Convergence in the European Union and the Pentagon of Competitiveness

Mariusz Próchniak

2.1. Introduction

The aim of this chapter is to present the historical paths and current macroeconomic performance of the eleven Central and Eastern European (CEE) countries that joined the European Union in 2004, 2007 and 2013, namely Poland, Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Romania, Slovakia, and Slovenia (EU-11). As part of our analysis of past development patterns, we use a study of the income convergence of these countries relative to the fourteen Western European countries that are current members of the EU (EU-14).[1] We use the so-called 'pentagons of competitiveness' to analyse current macroeconomic performance. This tool can be used to assess individual countries based on five criteria: economic growth, inflation, unemployment, the public finance balance, and the current account balance. These variables represent important areas from the point of view of state economic policy, while also significantly affecting the competitiveness of economies. In our analysis of the pentagons of competitiveness, we compare seven CEE countries (four V4 countries and three Baltic States) with five Western European countries, representing the three Western European models of capitalism: the Continental model (Germany and France), the Mediterranean model (Spain and Italy) and the Nordic model (Sweden).

The study is a continuation of previous research on this topic, presented in previous versions of the report. Previous research on income convergence is included for instance in: Matkowski, Rapacki, Próchniak [2016a] and Próchniak [2017, 2018, 2019, 2020, 2022, 2023], while the pentagons of competitiveness are discussed for instance in: Matkowski, Rapacki, Próchniak [2016b]; Próchniak [2023]; Rapacki, Próchniak [2017,

[1] The study covers the following Western European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and Sweden. The United Kingdom is excluded from the analysis as it is no longer a member of the Union.

2018, 2019a, 2020]. The 2013 edition of the report also includes a regional convergence analysis covering regions of all EU countries [Matkowski, Próchniak, 2013].

2.2. Theoretical foundations of income level convergence analysis

The theoretical framework for income level convergence analysis is provided by economic growth models. Neoclassical economic growth models [e.g., Solow, 1956; Mankiw, Romer, Weil, 1992] confirm conditional β-convergence. This is the case when less developed countries (with a lower level of GDP per capita) have faster economic growth rates than more developed countries. Convergence is conditional because it only occurs when all countries are moving towards the same long-run equilibrium (steady state). The β-convergence hypothesis can be explained using the Solow model as an example [see Rapacki, Próchniak, 2012; Próchniak, Witkowski, 2012].

In the Solow model, the fundamental equation describing the rate of growth of an economy moving towards a steady state takes the following form:

$$\dot{k} = sf\left(k\right) - \left(n + a + \delta\right)k, \tag{2.1}$$

where: k – capital per unit of effective labour in year t, $\dot{k}$ – change in k per unit of time (mathematically it is the time derivative of k), s – savings rate, $f(k)$ – production function (expressed per unit of effective labour), n – population growth rate, a – rate of exogenous technical progress, δ – capital depreciation rate. In the analysis of the Solow model with technical progress, the symbols k and $f(k)$ stand for capital and output per unit of effective labour, respectively, where effective labour is the product of the technology level and the labour force level.

If we assume that the production function is of the Cobb-Douglas type $f(k) = k^{\alpha}(0 < \alpha < 1)$, equation (2.1) transforms into:

$$\dot{k} = sk^{\alpha} - \left(n + a + \delta\right)k. \tag{2.2}$$

By dividing equation (2.2) by k, we obtain the formula for the rate of capital growth per unit of effective labour during the transition towards a steady state:

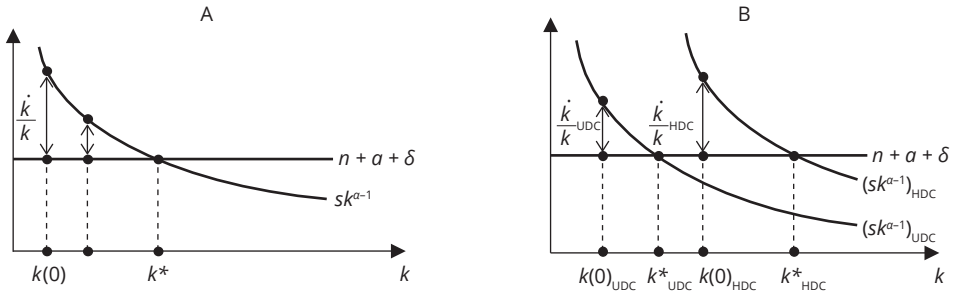
$$\frac{\dot{k}}{k} = sk^{\alpha-1} - \left(n + a + \delta\right). \tag{2.3}$$

Since output is in direct proportion to capital, an analogous equation characterises the rate of growth of GDP per unit of effective labour.

The best way to illustrate the convergence hypothesis is to analyse equation (2.3) graphically. This is shown in Figure 2.1. The growth rate is equal to the vertical distance between the curve $sk^{\alpha-1}$ and the straight line $n + a + \delta$. As illustrated, an economy that starts from an initial capital level of $k(0)$ and reaches a capital stock in long-run equilibrium k^* shows a declining rate of economic growth. Convergence is conditional because it only occurs when both economies are moving towards the same long-run equilibrium.

To illustrate the conditional nature of convergence, let us consider two countries: a highly developed country and an underdeveloped country with different savings rates. As the savings rate in the developed country is higher, the capital stock in long-run equilibrium is also higher there. This is illustrated in part B of Figure 2.1. Even though a highly developed country starts from a higher level of capital, it shows faster economic growth as it moves towards a different long-run equilibrium state. In this case, convergence will not occur.

Figure 2.1. Economic growth in the Solow model



Notes:
HDC – highly developed country,
UDC – underdeveloped country.

Source: own elaboration.

An important objective of the empirical study is to estimate the value of the parameter β, which measures the speed of the convergence process to a steady state, according to the following equation:

$$\frac{\dot{y}}{y} = \beta(\ln y^* - \ln y), \tag{2.4}$$

where: y – output per unit of effective labour in year t, $\dot{y}$ – change of y per unit of time (time derivative), y^* – output per unit of effective labour in a steady state.

The parameter β indicates the distance towards a steady state that the economy covers in a single period (year). For example, when $\beta = 0.02$, the economy covers 2% of the distance each year.

Another type of convergence is σ-convergence. This occurs when the income differential between countries decreases over time. The income differential can be measured by the standard deviation, variance, or coefficient of variation of GDP per capita levels between countries or regions.

From a theoretical point of view, σ-convergence is a necessary but not sufficient condition for β-convergence to occur. Therefore, it is possible (although unlikely) that the income gap between economies will widen over time and, at the same time, the less developed country will show a faster rate of economic growth. This will occur when a less developed country achieves such a rapid rate of economic growth that it outperforms a more developed country in terms of income levels and the development gap in the final period is greater than in the initial period.

To verify the occurrence of absolute β-convergence, we use the following regression equation:

$$\frac{1}{T}\ln\frac{y_T}{y_0} = \alpha_0 + \alpha_1 \ln y_0 + \varepsilon_t, \tag{2.5}$$

where y_T and y_0 are the per capita income in the final and initial year, and ε_t is the random component. The dependent variable is therefore the average annual growth rate of real GDP per capita at purchasing power parity (PPP) between period T and 0, while the independent variable is the natural logarithm of GDP per capita in the initial period. If the α_1 parameter is negative and statistically significant (we assumed a significance level of 5% in the empirical analysis), β-convergence occurs. In this situation, we can calculate the value of the β-coefficient, which measures the rate of convergence:

$$\beta = \frac{1}{T}\ln\left(1+\alpha_1 T\right). \tag{2.6}$$

To verify the occurrence of σ-convergence, we estimate a trend line for the income differential between countries:

$$sd\left(\ln y_t\right) = \alpha_0 + \alpha_1 t + \varepsilon_t, \tag{2.7}$$

where *sd* is the standard deviation and *t* is the time (t = 1, …, 31 for the period 1993–2023). Thus, the dependent variable is the standard deviation of the natural logarithms of GDP per capita between countries, and the independent variable is time. If the α_1 parameter is negative and statistically significant, σ-convergence occurs.

2.3. Income convergence of the EU-11 in relation to the EU-14 – results of the empirical study

The study covers the period 1993–2023. All calculations were also made for the three sub-periods: 1993–2000, 2000–2010 and 2010–2023, which makes it possible to analyse the temporal stability of the studied phenomenon. It also makes it possible to roughly determine the strength of the impact of a number of other underlying factors on the rate of reduction of income levels.

Table 2.1. Results of estimation of regression equations describing β-convergence

Period	a_0	a_1	*t*-stat. (a_0)	*t*-stat. (a_1)	*p*-value (a_0)	*p*-value (a_1)	R^2	β-convergence	β (%)
25 countries of the enlarged EU									
1993–2023	0.2000	−0.0176	7.04	−6.23	0.000	0.000	0.6278	yes	1.78
1993–2000	0.0612	−0.0028	0.93	−0.42	0.361	0.677	0.0077	no	–
2000–2010	0.3008	−0.0271	9.03	−8.36	0.000	0.000	0.7524	yes	2.75
2010–2023	0.2288	−0.0201	3.57	−3.28	0.002	0.003	0.3191	yes	2.03
2 regions (EU-11 and EU-14)									
1993–2023	0.2482	−0.0226	–	–	–	–	1.0000	yes	2.29
1993–2000	0.1333	−0.0104	–	–	–	–	1.0000	yes	1.04
2000–2010	0.3764	−0.0348	–	–	–	–	1.0000	yes	3.54
2010–2023	0.3939	−0.0360	–	–	–	–	1.0000	yes	3.67

Source: own elaboration.

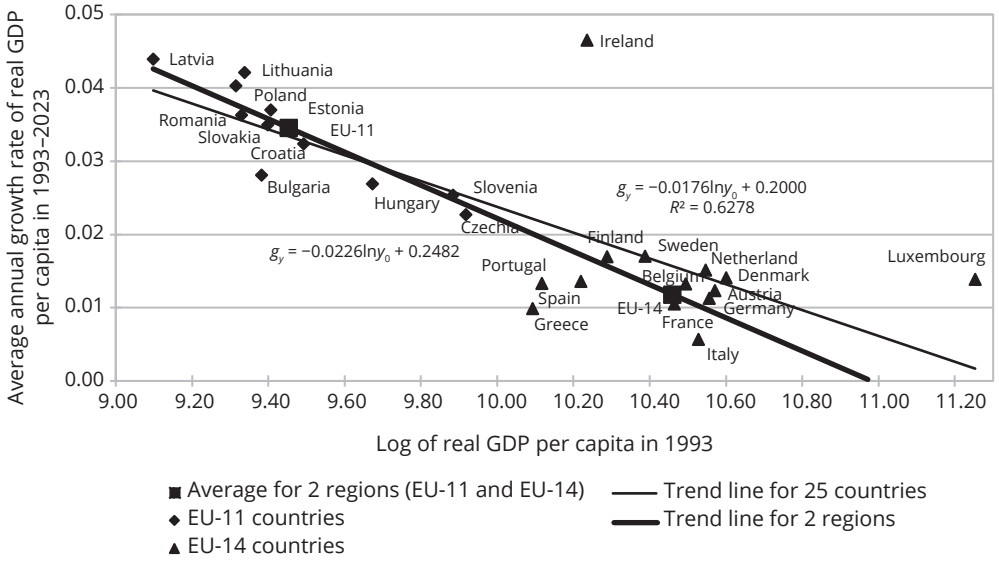
The calculations use a time series of real GDP per capita at purchasing power parity (in USD) derived from International Monetary Fund data [IMF, 2023].

The results of the analysis of the β-convergence of the EU-11 towards the EU-14 are shown in Table 2.1 and Figure 2.2. The convergence is analysed both within the EU-25 as a whole and between the two regions covering the EU-11 and EU-14. The aggregated data for the two areas: EU-11 and EU-14, is weighted averages with variable weights reflecting the population of a country included in a particular group in a given year.

The results confirm clear income convergence of the EU-11 in relation to the EU-14 over the entire 1993–2023 period. Convergence occurred both among the 25 countries in the study group and between the two areas of the EU-11 and EU-14. Countries with lower income in 1993 showed – on average – faster economic growth rates in 1993–2023 than the countries that were more developed at the outset. As the less

developed countries in 1993 were the CEE countries, these results confirm the clear convergence of the EU-11 to the average income level of Western Europe.

Figure 2.2. Relationship between the growth rate of GDP per capita in 1993–2023 and GDP per capita at the beginning of the period



Source: own elaboration.

Analysis of Figure 2.2 shows that the distribution of points representing individual countries is not strong relative to the negatively sloping trend line. This results in a relatively high value of the coefficient of determination of 63%. Thus, differences in initial income levels make it possible to account for almost two-thirds of the variation in economic growth rates between 1993 and 2023.

By looking at the points representing individual countries, it is possible to compare the situation of individual countries and, from this perspective, assess the changes in their competitive position over the entire period. Among the CEE countries in the study group, the Baltic republics and Poland had the highest growth rates. Latvia, Lithuania, Poland and Estonia showed average annual economic growth in 1993–2023 of between 4.4% (Latvia) and 3.7% (Estonia) with relatively low initial income levels. Slovakia and Romania also recorded relatively high economic growth rates of 3.5–3.6%. The results achieved by these countries reinforced the group-wide trend towards convergence. As can be seen, Poland's situation compares favourably with other countries, ranking third among the 11 CEE countries in terms of the average

economic growth rate in 1993–2023 (with a result of 4.0%), which was one of the factors behind the strengthening of the competitive position of the Polish economy.

The aggregated data for the two areas: EU-11 and EU-14 also confirms convergence over the period 1993–2023. In Figure 2.2, the points representing these two areas are marked with squares. The EU-11 group as a whole showed a higher growth rate than the EU-14 area, with much lower initial income.

The β-coefficients, measuring the speed of the convergence process, are 1.78% for the 25 countries and 2.29% for the two areas. They make it possible to estimate the time needed to narrow the development gap between the countries studied. Namely, if the average economic growth trend of 1993–2023 is maintained, the countries of the enlarged EU will need about 30–40 years to halve the gap to a common hypothetical long-run equilibrium state (this result was calculated as follows: $-ln(0.5)/0.0178 = 38.9$ years and $-ln(0.5)/0.0229 = 30.3$ years). These results represent a slow convergence of the EU-11 to Western Europe. Based on these estimates, it is difficult to expect a rapid alignment of income between Poland and other CEE countries on the one hand and Western Europe on the other in the medium term.

This result should be viewed with some circumspection, as it is based on model premises that may not prove correct in reality. Namely, this assumes declining marginal productivity of capital (in line with the neoclassical production function) and the fact that economies move towards a steady state with a declining rate of economic growth and will achieve this state at infinity. Therefore, when interpreting these results, it makes sense to quote the half-life rather than the period needed to close the income gap completely. It is worth juxtaposing these results with other forecasts, presented in the *Report of SGH Warsaw School of Economis and the Economic Forum*, which show for instance that Poland will catch up with Western Europe within ten or more years [Próchniak, Lissowska, Maszczyk, Rapacki, Sulejewicz, 2019].

It is worth looking at how the stability of convergence processes have stabilised over time. It appears that the rate of convergence was very different in the sub-periods identified. One of the causes of the high instability of the rate of convergence in the countries studied was the global crisis, the COVID-19 pandemic, and the varied impact of institutional factors on economic growth related, for example, to EU membership. For the 25 EU countries in the period 1993–2000, there was no statistically significant reduction of the income gap for the EU-11 countries to the EU-14 (on a group average basis). For 1993–2000, the slope of the trend line is negative, but not statistically significant. These model estimation results imply de facto that no convergence occurs, despite the negative slope of the trend line. There was a significant increase in the rate of convergence between 2000 and 2010, which undoubtedly had its origins in EU

enlargement.[2] The marked trend towards convergence noted in the first decade of the twenty-first century weakened in the second decade. This was largely due to the crises related to the COVID-19 pandemic and the war in Ukraine, and the interruption of the previous stable economic growth paths of the countries studied.

The β-convergence results presented here are averaged for the entire region. As Figure 2.2 shows, the various CEE countries showed different rates of economic growth and varying degrees of convergence to Western Europe. The convergence of individual EU-11 countries relative to the EU-14 in the sub-periods identified is worth analysing.

Figure 2.3 shows the decrease in percentage points in the income gap of individual EU-11 countries relative to the EU-14 area in the periods 1993–2000, 2000–2010 and 2010–2023. The data shown in Figure 2.3 partly supports the conclusions of the β-convergence analysis. Namely, in all countries, the income gap narrowed at the slowest rate in the first sub-period identified, i.e., 1993–2000. Moreover, in these years, two countries (Bulgaria and Romania) even widened the development gap to Western Europe. The unusual performance of Bulgaria and Romania was partly due to the fact that in these countries the integration anchor associated with EU enlargement came into effect later than in the rest of CEE (with the exception of Croatia, which was the latest country to join the EU). In the period 1993–2000, Poland narrowed the gap to the fourteen Western European countries by 8 p.p. and was the leader in this respect (ex aequo with Estonia).

After 2000, the catch-up rate accelerated across the EU-11. Most CEE countries narrowed the income gap to the EU-14 by 10 p.p. or more in both the first and second decades of the twenty-first century. The frontrunner was Lithuania, which narrowed the development gap to Western Europe by 21 p.p. between 2000 and 2010, and by 27 p.p. between 2010 and 2023. Latvia, Poland and Romania were also leaders, narrowing the development gap to the EU-14 in two consecutive decades of the twenty-first century by 16 p.p. and 20 p.p., respectively (Latvia), by 14 p.p. and 21 p.p. (Poland) and by 17 p.p. and 21 p.p. (Romania).

In the case of Poland, an important role in accelerating the convergence rate after EU enlargement was played by European funds, which increased the competitiveness of its economy. Poland was the largest beneficiary of EU funds under the 2007–2013 budget. The flow of funds provided by the EU under various aid programmes helped to improve the rate of growth of the Polish economy on the demand and supply side, thanks to which Poland has performed relatively well in terms of economic growth rates in recent years (it was the only EU country to avoid a recession during the recent

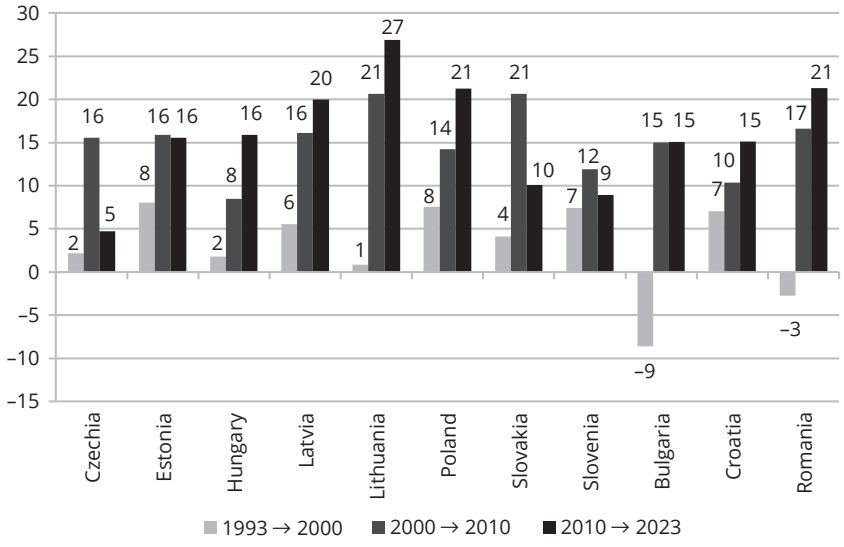
[2] The positive impact of EU membership on the economic growth of the 11 CEE countries is also confirmed in the paper by Rapacki and Próchniak [2019b].

global financial crisis). The EU's 2014–2020 budget and the continuation of the large inflow of structural funds to the new member states were also factors that help to sustain Poland's faster pace of convergence to Western Europe in the last sub-period analysed.

The accumulation of human capital was also an important source of Poland's convergence towards Western Europe. Human capital is a very important input. The rapid increase in human capital was caused by many factors, including a better health of people. The improvement in society's health resulted from, e.g., better access to doctors and hospitals through the development of, among others, private health care, increased health prevention, and paying more attention to environmental issues.

The expansive fiscal and monetary policies pursued in Poland over the past few years by the government and the central bank have also helped to maintain strong economic momentum despite the COVID-19 pandemic. Large-scale infrastructure projects, including, for example, the continued construction of motorways and expressways (such as Via Baltica and Via Carpatia), the modernisation of railway lines and the purchase of new rolling stock, the crosscut of the Vistula Spit or the construction of the tunnel under the Świna River in Świnoujscie, as well as large social programmes resulting in an increase in disposable household income, are just some examples of measures that have stimulated the Polish economy.

Figure 2.3. EU-11 countries' reduction in income gap to the EU-14 in three successive sub-periods (p.p.)



Notes: in each year GDP per capita at PPP in the EU-14 was assumed to be 100.

Source: own elaboration based on IMF [2023] data.

As a result, Poland ranks fourth in the EU-11 in terms of relative income per capita (at PPP). According to IMF data from October 2023, Poland's GDP per capita in 2023 was 75% of the average income per capita of Western Europe (EU-14). Poland was outperformed by Slovenia (85%) and Lithuania and Czechia (81%). This is a significant improvement compared to data from several years ago, when Poland was at the tail end of the group. This is also an improvement of one place on the 2022 ranking. Despite the war in Ukraine, Poland will hopefully continue its successful development trends and further reduce its development gap to Western Europe in the years to come.

We measure the σ-convergence of CEE countries to Western Europe by changes in the standard deviation of the natural logarithms of GDP per capita between the 25 EU countries, as well as between the two areas (EU-11 and EU-14). The results of the trend line estimation for the standard deviations are shown in Table 2.2, and Figure 2.4 provides a graphical representation of the results.

The data in Table 2.2 shows that there was σ-convergence over the whole 1993–2023 period both among the EU-25 and between the EU-11 and EU-14 areas. The slopes of both estimated trend lines are negative and statistically significant at very high significance levels (as indicated by *p*-values of 0.000). The high values of the coefficients of determination (over 90%) show a high level of alignment of the empirical points with the trend lines.

Table 2.2. Results of estimation of regression equations describing σ-convergence

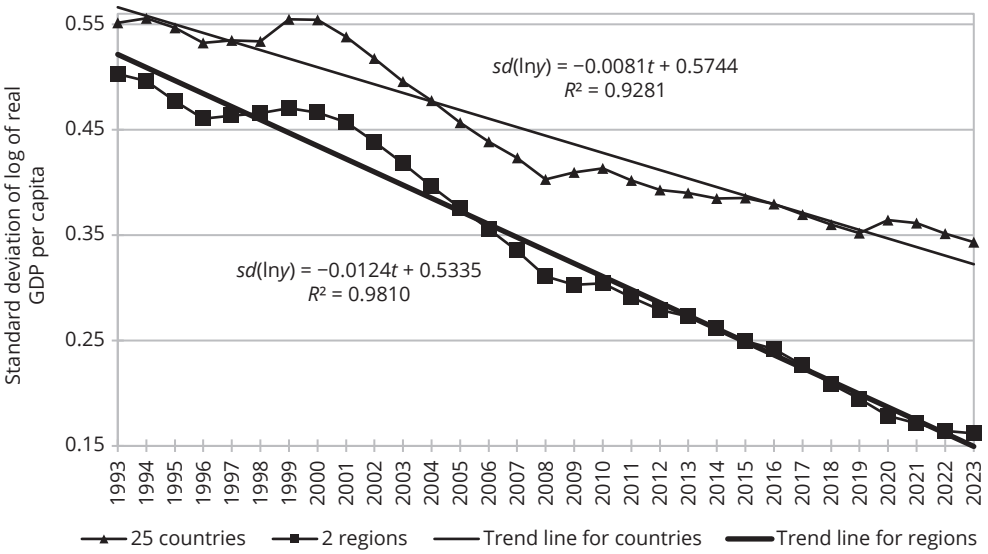
Period	a_0	a_1	*t*-stat. (a_0)	*t*-stat. (a_1)	*p*-value (a_0)	*p*-value (a_1)	R^2	σ-convergence
25 countries of the enlarged EU								
1993–2023	0.5744	−0.0081	74.48	−19.35	0.000	0.000	0.9281	yes
1993–2000	0.5465	−0.0003	64.52	−0.16	0.000	0.881	0.0040	no
2000–2010	0.5614	−0.0159	66.73	−12.83	0.000	0.000	0.9481	yes
2010–2023	0.4107	−0.0048	129.84	−12.87	0.000	0.000	0.9324	yes
2 regions (EU-11 and EU-14)								
1993–2023	0.5335	−0.0124	90.88	−38.69	0.000	0.000	0.9810	yes
1993–2000	0.4973	−0.0049	58.16	−2.91	0.000	0.027	0.5857	yes
2000–2010	0.4881	−0.0183	91.33	−23.27	0.000	0.000	0.9837	yes
2010–2023	0.3170	−0.0118	106.84	−33.72	0.000	0.000	0.9896	yes

Source: own elaboration.

Figure 2.4 shows the trend of the standard deviation of the logarithms of GDP per capita. As can be seen, the income gap between the new and old EU countries showed,

in general, a decreasing trend. Income disparities were most visibly and systematically reduced in the second part of the analysed period, i.e., from 2000 onwards. In 2009 and 2010 – as a result of the global financial crisis and the weakening of GDP growth in many countries with fast growth up until that time – income disparities among the 25 countries in the study group widened. Divergence in the EU-25 also occurred in 2020 as a result of the Coronavirus pandemic, although data averaged over the two areas does not confirm this. Recent years, with the energy crisis and the war in Ukraine, have been marked by a slowdown in convergence processes.

Figure 2.4. Standard deviation of GDP per capita in 1993–2023



Source: own elaboration.

Comparing our results to those of other analyses, there are many empirical studies on convergence and it is impossible to list them all here. For a detailed review of empirical studies, see for instance Matkowski, Rapacki and Próchniak [2016c]. The books by Malaga [2004], Michałek, Siwiński and Socha [2007], Liberda [2009], Batóg [2010], Próchniak and Witkowski [2016], Jóźwik [2017], and Kotliński and Warżała [2020] are either entirely or largely devoted to convergence in EU or OECD countries. In turn, the books by Wojcik [2018] and Bernardelli, Próchniak and Witkowski [2021] contain some novel approaches to measuring the convergence process, together with extensive empirical analysis.

Comparing the results obtained here with literature, works suggesting the possibility of divergence in Europe (both at national and regional level) are common.

For example, Mucha [2012] suggests that for some Eurozone countries, having a common currency can be a source of many problems and the emergence of economic divergence from the other members of the economic and monetary union. Monfort, Cuestas and Ordóñez [2013] analyse the real convergence of GDP per worker in 23 EU countries over the period 1980–2009 (Western European countries) and 1990–2009 (Central and Eastern European countries), showing that, when applying club convergence survey techniques, there are strong indications of EU-wide divergence of income per capita, but that, for example, Central and Eastern European countries (excluding Czechia but including Greece) form a converging group. Borsi and Metiu [2013] analyse the real convergence of the 27 EU countries over the period 1970–2010, concluding that there is no convergence in income per capita levels across the group and that there is convergence in subgroups of countries moving towards different steady states. Staňisić [2012] analyses β-convergence in the EU-25 and within two groups of countries, the EU-15 and EU-10, confirming β-convergence in the EU-25 (implying convergence of new EU member states towards Western Europe) and denying convergence within the EU-15 and EU-10 groups. The author of the cited study further argues that income disparities between the EU-25 countries increased during the global financial crisis, but that the extent and temporal scope of this increase were limited and did not affect the long-term convergence path, which is a finding very similar to the results of our study.

As can be seen, the convergence process does not therefore occur automatically. Despite the strong trend of narrowing income disparities between Central and Eastern Europe and Western Europe in recent years, there is no guarantee that this will continue in the future (as evidenced by the temporal instability of our results and the increasing references in literature to the possibility of divergence trends in Europe). An extremely important task for economic policymakers is therefore to take action to maintain the current long-term trends of economic growth in Europe, marked by the decreasing income disparities between the eastern and western areas of the continent.

2.4. Pentagons of competitiveness

We will use the 'pentagons of competitiveness' to assess the current condition of the economy. These can be used for a comparative analysis of countries on the basis of five commonly used variables reflecting the state of the economy:

a) economic growth rate,
b) unemployment rate,
c) inflation rate,

d) public finance balance,
e) current account balance.[3]

The overall condition of the Polish economy will be compared with the situation in six other CEE countries: three V4 countries (Czechia, Slovakia, Hungary) and three Baltic states (Lithuania, Latvia, Estonia), as well as with the situation in five Western European countries: Germany, France, Italy, Spain and Sweden. The selected Western European countries represent three models of Western European capitalism, according to Amable's [2003] classification: the Continental model (Germany and France), the Mediterranean model (Spain and Italy) and the Nordic model (Sweden). In our analysis, we leave aside the Anglo-Saxon (liberal) model, whose flagship representative (the United Kingdom) is no longer a member of the European Union.

Table 2.3. Main macroeconomic indicators in Poland and selected EU countries in 2023

Country	GDP growth (%)	Inflation (%)	Unemployment (%)	Public finance balance (% of GDP)	Current account balance (% of GDP)
CEE countries					
Poland	**0.6**	**12.0**	**2.8**	**−5.3**	**1.0**
Czechia	0.2	10.9	2.8	−4.1	0.5
Slovakia	1.3	10.9	6.1	−5.5	−2.7
Hungary	−0.3	17.7	3.9	−5.5	−0.9
Lithuania	−0.2	9.3	6.5	−1.8	0.0
Latvia	0.5	9.9	6.7	−3.7	−3.0
Estonia	−2.3	10.0	6.7	−3.9	1.8
Western European countries					
Germany	−0.5	6.3	3.3	−2.9	6.0
France	1.0	5.6	7.4	−4.9	−1.2
Spain	2.5	3.5	11.8	−3.9	2.1
Italy	0.7	6.0	7.9	−5.0	0.7
Sweden	−0.7	6.9	7.5	−0.4	5.4

Notes: all figures are estimates; inflation figures refer to the average annual rate of growth in prices of consumer goods and services.

Source: IMF [2023].

[3] The idea of this type of pentagons came from Zbigniew Matkowski, PhD. For a detailed description of the idea of pentagons and their interpretation, see earlier editions of the *Report* [e.g., Matkowski, Rapacki, Próchniak, 2016b].

Table 2.3 provides data on five indicators describing the overall economic condition of Poland and the comparator countries in 2023. All figures are preliminary estimates. At the time of writing this chapter (November 2023), we do not yet have full data for 2023, but only estimates. In our analysis, we used the most recent (October 2023) International Monetary Fund data available at the time of writing.

Figure 2.5 shows the pentagons of competitiveness. They illustrate the degree to which the five basic macroeconomic objectives are met:

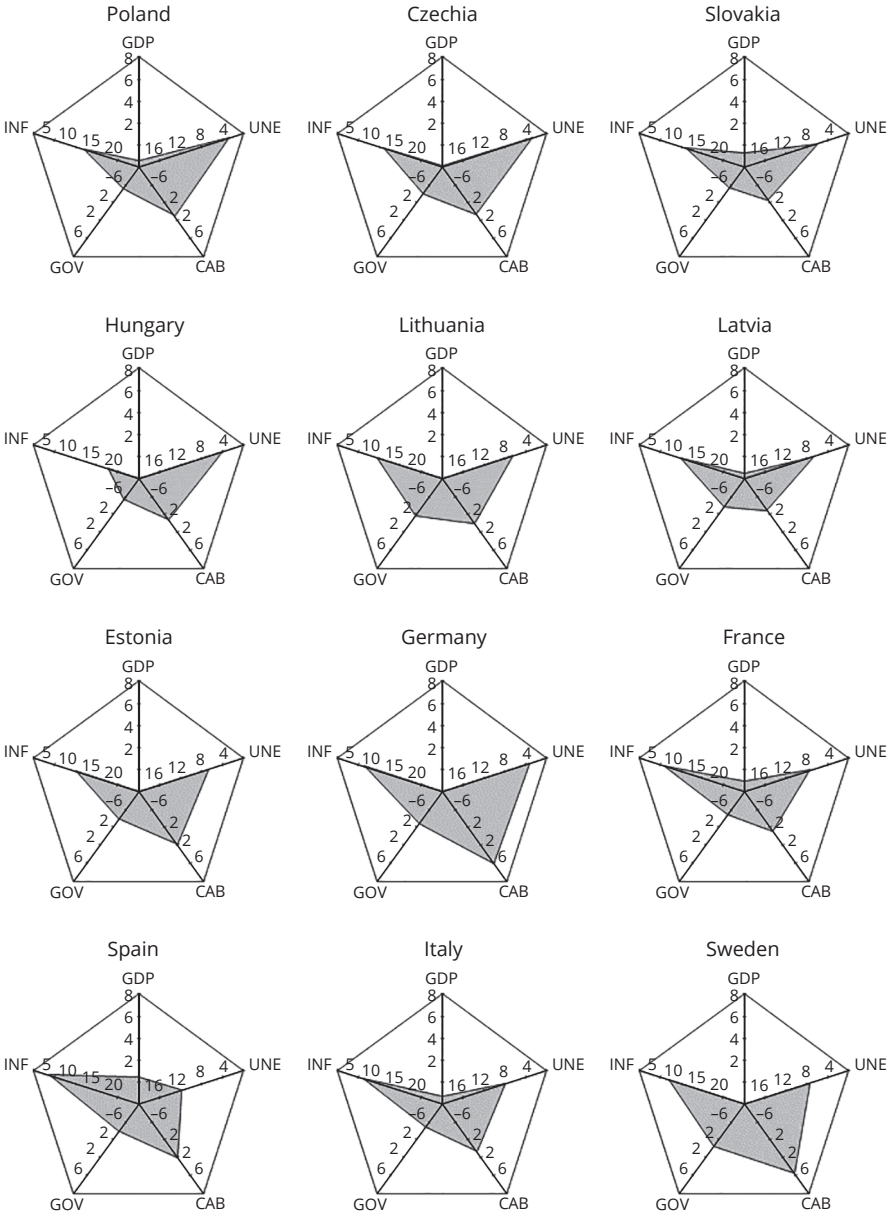
a) economic growth,
b) full employment,
c) internal balance (no inflation),
d) balance of public finance,
e) external balance.

The degree of achievement of the above objectives is expressed by the variables plotted on the numerical axes of the pentagons.

The vertices of the pentagons, showing the maximum or minimum values of each variable, are treated as desirable (positive) targets, although this can sometimes be debatable. For example, a large surplus in the current account balance or a surplus in the state budget is not necessarily an optimum solution, nor is zero inflation or zero unemployment. Another problem is the interdependencies and, in particular, the conflicts between the various macroeconomic objectives, e.g., the fact that low unemployment (according to the Phillips curve) is often matched by high inflation and vice versa. A separate issue is the relative importance of individual criteria (e.g., whether low inflation is as important as low unemployment). All these reservations must be taken into account when interpreting the charts.

When comparing pentagons illustrating the economic situation of different countries in a particular year, both the plotted area of the pentagon and its shape should be taken into account. A larger pentagon indicates a better overall condition of the economy, and its more harmonious shape suggests more sustainable development. Of course, such an assessment is based solely on the five macroeconomic criteria mentioned above, which describe the current condition of the economy. It does not reveal the size of the economy, its economic potential and its growth prospects. It does not even convey much about the possible economic situation of a country in the next year, although the good current condition of the economy increases the chances that it will continue on a sustainable growth path in the near future as well. Nevertheless, in analyses based on this method, the results must be interpreted with great caution.

Figure 2.5. Economic condition of Poland and certain other EU countries in 2023



Notes:
GDP – GDP growth rate (%),
INF – inflation rate (%),
UNEMP – unemployment rate (%),
PFB – public finance balance (% of GDP),
CAB – current account balance (% of GDP).

Source: own elaboration based on data from Table 2.3.

In 2023, the overall macroeconomic condition of the CEE countries was poor. The CEE group as a whole recorded relatively low growth rates, with three countries, Hungary, Lithuania and Estonia, slipping into recession. Another problem was high inflation. The V4 countries recorded inflation ranging from 11–12% (Slovakia, Czechia and Poland) to almost 18% (Hungary), while the Baltic States recorded inflation of 9–10%. Such a rapid increase in prices was due to causes including the war in Ukraine and the energy crisis caused by a reduction in the supply of energy resources and an increase in their prices. The large deficit of the public finance sector, in most cases exceeding 3% of GDP, is also worrying. The CEE countries (with the exception of Slovakia and Latvia) did not record a large current account deficit. The unemployment rate in the new EU member states was also relatively good. In all seven CEE countries presented in the pentagons of competitiveness, the unemployment rate was in the single digit range. The best performers in this respect were Poland and Czechia, with an unemployment rate of 2.8%.

When comparing the overall health of the CEE economies to those of Western Europe, one important difference is striking. Namely, the inflation rate in Western European countries is much lower. Germany, France, Spain, Italy and Sweden recorded inflation at single digit levels not exceeding 7% (according to preliminary estimates). Such wide and regular differences between the inflation rates of the two groups of countries are due to the energy crisis and Russia's invasion of Ukraine. The CEE countries were much more dependent on Russia for imports of energy resources, so any restrictions and withholding of oil and gas supplies had a highly detrimental impact on the economic situation in the CEE countries, especially on inflation rates. Western European countries were more independent from Russia in terms of energy imports and were therefore less affected by the increase in energy prices.

Against the background of the entire group analysed in the pentagons, Poland's situation is moderate. In 2023, Poland performed well with regard to the unemployment rate (leading the group) and the current account balance (surplus of 1.0% of GDP). In terms of economic growth rates, Poland recorded a low but still positive rate of growth of GDP, in contrast to many countries that experienced a recession. Poland's scores were poor in the case of the inflation rate (the second fastest price change in the group of countries analysed in the pentagons) and the public finance balance (a deficit of 5.3% of GDP).

2.5. Conclusions

Across the group of 25 countries in the enlarged European Union, there is both β- and σ-convergence of income. In 1993–2023, there was a negative correlation between the rate of economic growth and the initial level of GDP per capita. The new EU member states in Central and Eastern Europe achieved faster economic growth than Western European countries, even though the initial level of GDP per capita in the former was much lower. Income disparities narrowed, especially after 2000, though they are still large.

However, a reduction in the differences in competitiveness as measured by the standard of living of the societies of the old and new EU countries cannot be unconditionally expected in the short term. The acceleration of the convergence process will depend on factors such as sound economic policies aimed at narrowing the development gap between Central and Eastern Europe and Western Europe. The war in Ukraine and the energy crisis will also have a significant impact on future economic growth. These factors pose a danger of a significant weakening of convergence and even the emergence of divergent tendencies in the future. Hopefully, such a pessimistic scenario will not materialise and the CEE countries will continue on their path of rapid economic growth and closing the development gap to Western Europe.

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Chapter 3

Healthcare Infrastructure in Poland in Comparison with the European Union

Dawid Majcherek

3.1. Introduction

The primary goal of the healthcare system should be to achieve maximum health effect with efficient use of available resources, which will lead to a healthier life expectancy. This strategy can be executed through activities targeted at improving the quality and availability of services, which will result in better treatment outcomes and increased patient satisfaction, as well as improving efficiency and achieving financial sustainability for stakeholders in the health care system [Naczelna Izba Kontroli, 2018]. Poland's health care system is managed by the Ministry of Health with purchasing in hands of the National Health Fund (NFZ) and finance by social health insurance (SHI) [European Observatory on Health Systems and Policies et al., 2022]. The Polish government announced to increase the public expenditure on health to 6% of GDP by 2024 [WHO et al., 2019b]. According to government, this goal should be even achieved in 2023 [Maląg, 2022]. According to WHO, increase of spendings on healthcare is "an opportunity to tackle certain longstanding imbalances in the health sector, including overreliance on acute hospital care compared with other types of care, including ambulatory care and long-term care; shortages of human resources; the negligible role of health promotion and disease prevention vis-à-vis curative care; and poor financial situation in the hospital sector" [WHO et al., 2019b]. It is crucial to invest in resources in order to implement project such as primary care reform, oncology hospital network, national oncology strategy, national cardiology network or rare disease national plan. The Polish health system is characterized by weak referral between non-hospital care and hospital care [European Observatory on Health Systems and Policies et al., 2022]. The health system development strategy should address the priority directions related to demographic challenges (the aging population) and epidemiological challenges (chronic diseases and oncology). The comparison between Poland and the all EU member states should take into account health-care cost, resources, quality of care and

outcomes [Chaupain-Guillot, Guillot, 2015; Walshe et al., 2013]. There is enormous opportunity for country's governments to learn from each other how to shape healthcare systems more efficiently. One of the most important in improving access to medical services is number of physicians and healthcare personnel per capita [Chaupain-Guillot, Guillot, 2015]. Although density of healthcare professionals is important, commitment to quality of healthcare and improvement of patients outcomes seems be event more crucial for healthcare system management [WHO et al., 2019a]. It was established by Sustainable Development Goals (SDG) under target 3.8: "achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all" [United Nations, 2015]. Achieving high quality of medical services should be a common goal at every step of care including: primary prevention, acute care, chronic care and palliative care. Indeed, the differences in access to health services between EU countries are explained by the organization and public and private financing [Chaupain-Guillot, Guillot, 2015]. Importantly, in almost all EU countries, general access to healthcare are financed by public funds. For instance, the public and private healthcare expenditures are twice higher than other high-income countries while quality of care is not significantly higher [Papanicolas, Woskie, Jha, 2018]. Thus, patients lifestyle and other socio-economic factors seems to play important role not only in physical health but also in mental health improvement [Majcherek, Kowalski, Lewandowska, 2022]. By taking into account socio-economic status of inhabitants the analysis of contribution to improvement of population's health status by the increase of health expenditures should be deployed. There is interesting question if quality of healthcare is only in hands of healthcare professionals or rather technologies, payers or patients [WHO et al., 2019a]. There are a lot of inefficiency in healthcare system management across the EU countries [Asandului, Roman, Fatulescu, 2014]. However, there are several studies showing positive impact of higher hospital beds [Gillani, Bhatti, Ali, Ahmad, 2022; Paramita, Paramita, Yamazaki, Koyama, 2020; Roffia, Bucciol, Hashlamoun, 2023], higher number of general practitioners (GP) [Blankart, 2012; Paramita et al., 2020], number of doctors [Hosokawa et al., 2020; Roffia et al., 2023] on adults and child health status and life expectancy in different regions of the world. Improvement of life expectancy is multi-dimensional function including healthcare spendings and social protection, number of hospital beds, socio-economic status and lifestyle of citizens [Kabir, 2008; Shaw, Horrace, Vogel, 2005; van den Heuvel, Olaroiu, 2017]. The objective of the chapter is a comparative analysis of key aspects of the infrastructure of the health sector in Poland in comparison to the EU countries in order to better identify areas for improvement to achieve an improvement in the health of Poles and the competitiveness of the economy in terms of health care with other EU countries.

3.2. Data

The following country-level data sources, which affect the availability, quality and efficiency of health care were used for this analysis:

1) general government expenditure on health (% of GDP) [Eurostat, 2020a],
2) domestic private health expenditure (PVT-D) as percentage of current health expenditure (CHE, %) [World Health Organization, 2020],
3) number of health personnel (excluding nursing and caring professionals) per 100 thousand inhabitants [Eurostat, 2020b],
4) number of general practitioners per 100 thousand inhabitants [Eurostat, 2020c],
5) number of hospital beds per 100 thousand inhabitants [Eurostat, 2019],
6) self-reported unmet needs for health care due to long waiting list [Eurostart, 2020],
7) healthy life expectancy (HALE) at birth (years) [WHO, 2019].

Comparison of health sector between Poland and other EU countries requires multi-dimensional perspective. This analysis includes macroeconomic data (public and private spendings on healthcare), human and infrastructure resources (including number of health personnel, number of GPs and hospital beds), unmet needs for healthcare due to long waiting list, quality of healthcare delivery and healthy lifestyle of society (measured by healthy life expectancy in years) in order to obtain a comprehensive picture of the state of the Polish health care system and compare it with the situation in other EU countries.

3.3. Results

The results of this research focus on comparison of Polish healthcare infrastructure to the situation in the EU. Moreover, within EU countries the comparison between Poland and Central and Eastern Europe (12 countries defined in Appendix materials table A3.1) and EU-15 (15 countries pre-2004 EU member states) was performed. In addition to healthcare infrastructure, this chapter with present the overview of patients access to healthcare and healthy life expectancy.

Table 3.1 shows that the general government expenditure on health in Poland in 2020 remains at the level of 5.4% of GDP which is significantly lower than other EU countries (on average 8.0% of GDP on health). Moreover, government spendings are lower by 0.7 p.p. than average for all CEE countries (5.4% for Poland vs. 6.1% for CEE). However, domestic private health expenditure as percentage of current health expenditure in Poland are higher than EU and CEE average (28.0% for Poland, 24.5%

for EU and 25.0% for CEE). Polish citizens spent more money from private budget on healthcare in comparison to other European citizens. Number of health personnel in Poland is almost twice lower in comparison to EU-15 countries (237 healthcare personnel per 100 thousand inhabitants in Poland vs. 400 healthcare personnel per 100 thousand inhabitants in the EU-15). This is almost 80 health personnel per 100 thousand inhabitants lower than CEE average. The number of GPs per 100 thousand inhabitants is more than twice lower thank EU average (42 GPs per 100 thousand inhabitants in Poland vs. 102 GPs per 100 thousand inhabitants in the EU). The similar problem in other CEE countries where number of GPs per 100 thousand inhabitants is close to 60. In term of access to healthcare, one in four polish patients (25.7%) declared unmet needs for health care due to long waiting list which is higher than CEE (16.5%), EU-15 (20.8%) and EU average (19.4%). The last but not least, healthy life expectancy in Poland remains 68.7 years which slightly higher than CEE average (68 years of HALE) but three years below EU-15 countries (71.5 years of HALE).

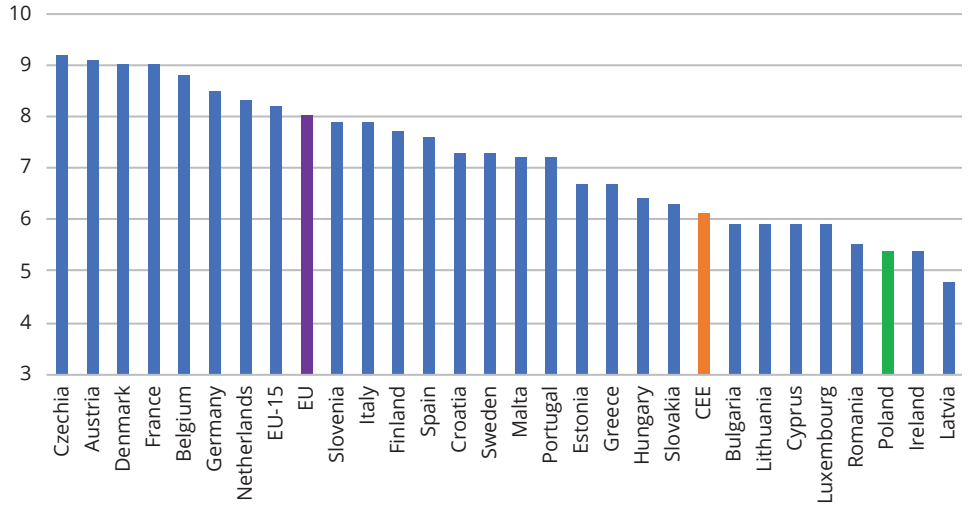
Table 3.1. Summary of microeconomic, human and infrastructure resources, unmet needs for healthcare, quality of healthcare delivery and health lifestyle in Poland, EU, EU-15 and CEE

	Poland	EU	EU-15	CEE
General government expenditure on health (% of GDP)	5.4	8.0	8.2	6.1
Domestic private health expenditure (PVT-D) as percentage of current health expenditure (CHE, %)	28.0	24.5	24.3	25.0
Number of health personnel (excluding nursing and caring professionals) per 100 thousand inhabitants	237.8	381.2	400.2	316.0
Number of general practitioners per 100 thousand inhabitants	41.9	102.3	114.9	59.6
Number of hospital beds per 100 thousand inhabitants	617.5	532.0	498.9	645.0
Self-reported unmet needs for health care due to long waiting list (%)	25.7	19.4	20.8	16.5
Healthy life expectancy (HALE) at birth (years)	68.7	70.9	71.5	68.0

Source: own elaboration based on Eurostat [2019, 2020a–d] and WHO [2019, 2020].

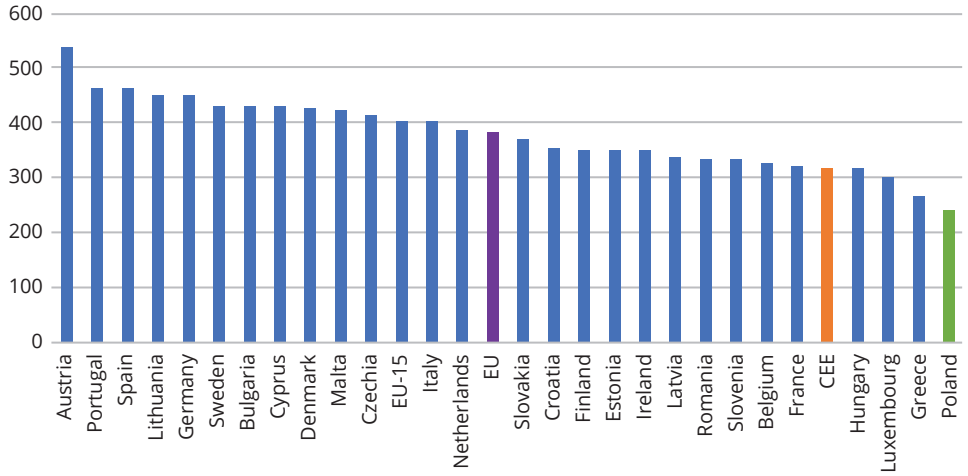
Figure 3.1 shows general government expenditure on health as percentage of GDP by countries in order from largest to smallest. The highest government expenditure on health in 2020 was in Czechia (9.2% of GDP, see Appendix file Table A3.1), Austria (9.1%) and Denmark (9.0% of GDP). The lowest one was in Latvia (4.8% of GDP), Ireland (5.4% of GDP) and Poland (5.4% of GDP).

Figure 3.1. Public spendings on health as percentage of GDP in all EU countries (descending order, % of GDP)



Source: own elaboration based on Eurostat [2019, 2020a–d] and WHO [2019, 2020].

Figure 3.2. Health personnel (excluding nursing and caring professionals) per 100 thousand inhabitants in all EU countries (descending order)

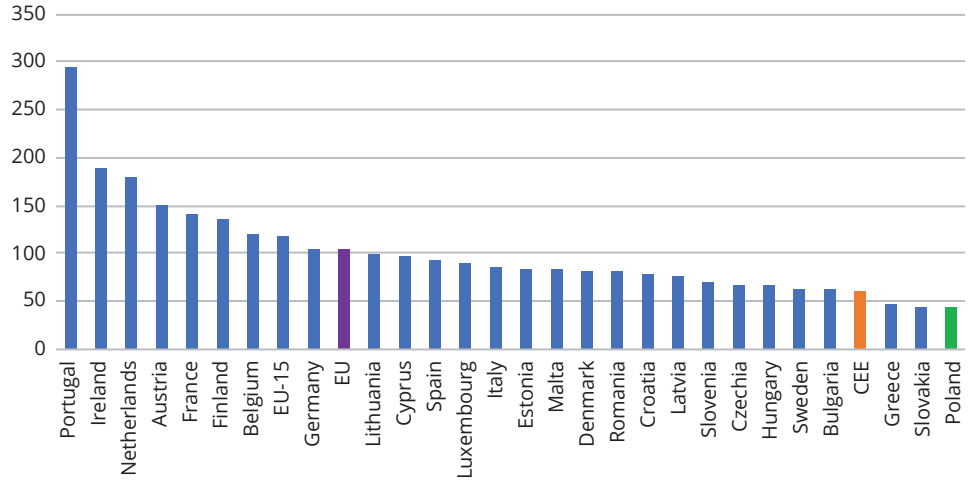


Source: own elaboration based on Eurostat [2019, 2020a–d] and WHO [2019, 2020].

Figure 3.2 shows number of health personnel (excluding nursing and caring professionals) per 100 thousand inhabitants by countries in order from largest to smallest. The highest number of health personnel (excluding nursing and caring

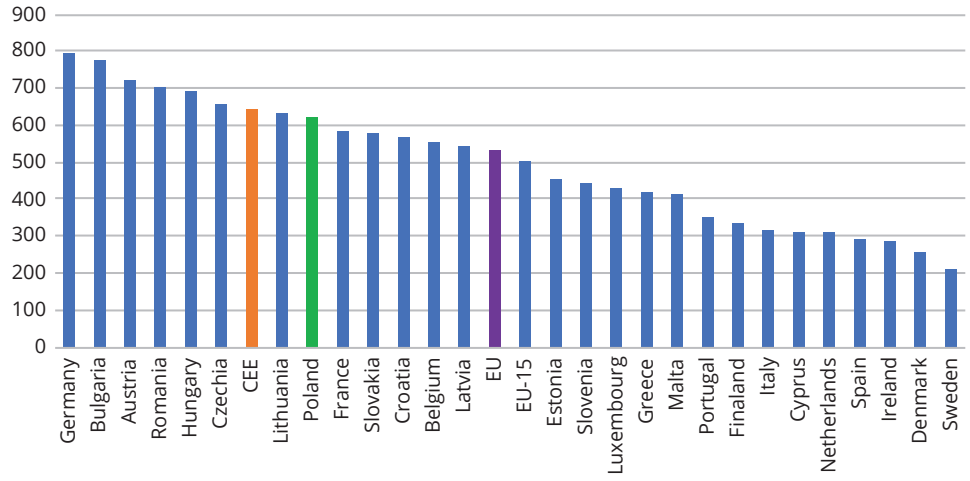
professionals) per 100 thousand inhabitants in 2020 was in Austria (534 health personnel per 100 thousand citizens, see Appendix file Table A3.1), Portugal (460) and Spain (457). The lowest numbers were in Poland (237 health personnel per 100 thousand inhabitants), Greece (262) and Luxembourg (298).

Figure 3.3. General practitioners per 100 thousand inhabitants in all EU countries (descending order)



Source: own elaboration based on Eurostat [2019, 2020a–d] and WHO [2019, 2020].

Figure 3.4. Hospital beds per 100 thousand inhabitants in all EU countries (descending order)

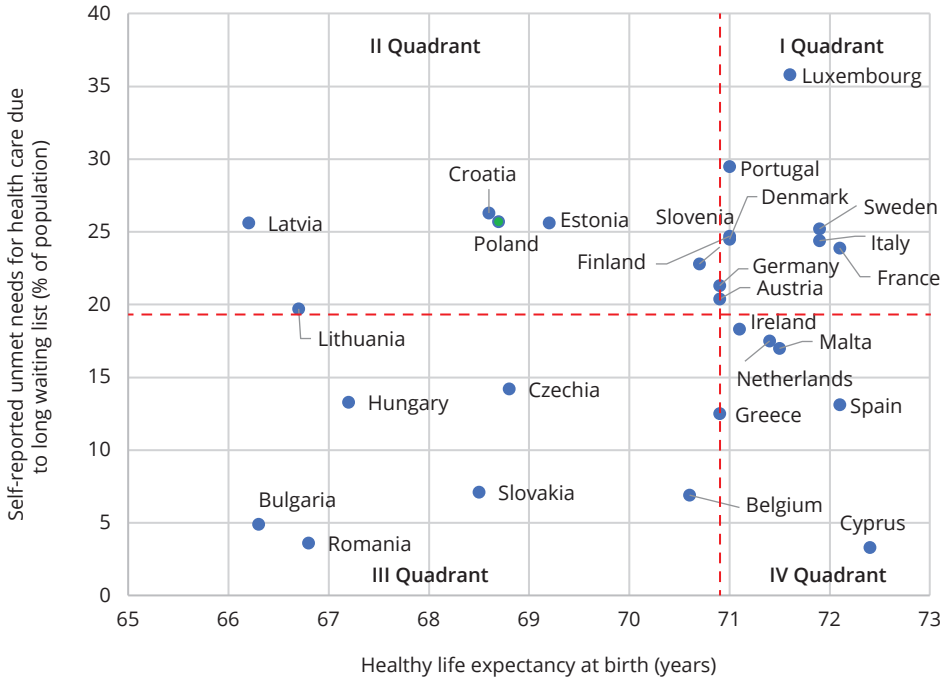


Source: own elaboration based on Eurostat [2019, 2020a–d] and WHO [2019, 2020].

Figure 3.3 shows number of general practitioners per 100 thousand inhabitants by countries in order from largest to smallest. The highest number of GPs per 100 thousand inhabitants in 2020 was in Portugal (292 GP per 100 thousand citizens, see Appendix file Table A3.1), Ireland (187) and the Netherlands (178). The lowest numbers were in Poland (42 GPs per 100 thousand inhabitants), Slovakia (43) and Greece (44).

Figure 3.4 shows number of hospital beds per 100 thousand inhabitants by countries in order from largest to smallest. The highest number of hospital beds per 100 thousand inhabitants in 2019 was in Germany (791 hospital beds per 100 thousand citizens, see Appendix file Table A3.1), Bulgaria (774) and the Austria (719). The number of hospital beds in Poland remains 618 per 100 thousand inhabitants thus Poland is on 8th place out of 27 EU countries. The lowest numbers were in Sweden (207 hospital beds per 100 thousand inhabitants), Denmark (260) and Ireland (288).

Figure 3.5. Overview of healthy life expectancy at birth in relation to self-reported unmet needs for healthcare due to long waiting list in all EU countries



Source: own elaboration based on Eurostat [2019, 2020a–d] and WHO [2019, 2020].

Figure 3.5 shows analysis of EU countries in terms of healthy life expectancy (years) on horizontal axis and percentage of society with self-reported unmet needs for health care due to long waiting list on vertical axis. The purple dotted lines presents the EU

average from Table 3.1 (19.4% of unmet needs and 70.9 years of HALE). The graph is divided into four quadrants. First one includes countries such as Austria, Denmark, Finland, France, Germany, Italy, Luxembourg, Portugal and Sweden with both HALE and unmet needs for healthcare also above EU average. Second quadrant presents countries only from CEE countries such as Croatia, Estonia, Lithuania, Latvia, Poland and Slovenia with lower HALE than EU average and high unmet needs for healthcare due to long waiting list. Third one includes countries such as Bulgaria, Czechia, Hungary, Romania, Slovakia and Belgium with lower HALE and lower unmet need to healthcare in comparison to EU level. The fourth quadrant covers countries only from EU-15 such as Greece, Ireland, Malta, the Netherlands and Spain where HALE is higher than EU average and unmet needs to healthcare is below EU level. The last quadrant includes countries with the best access to healthcare which may lead to high healthy life expectancy in years. Figure 4 shows that Poland is located at the opposite direction compared to Cyprus where HALE is one of the highest in EU (72.4 years, see Appendix file Table A3.1) and unmet need to healthcare due to long waiting list is one of the lowest (3.3% of inhabitants).

3.4. Discussion of the analysis results

Health is the result of mix of various factors from three main categories such as healthcare system infrastructure, lifestyle and socio-economic status of citizens [Joumard, Andre, Nicq, Chatal, 2010]. This research focus mainly on the first category. The analysis includes overview for Poland in the light of the all EU members states in terms of public and private expenditure on healthcare, number of hospital beds, number of healthcare personnel, number of GP. Moreover, a comprehensive comparison of self-reported unmet needs for health care due to long waiting list and healthy life expectancy was conducted.

Firstly, the scale of financing for healthcare services in Poland, as a share of health system expenditures in GDP, is low compared to other European countries (see Figure 3.1). This results in an insufficient supply of health services compared to the health needs of the population, as well as a high share of privately financed services in the total cost of services provided (see Table 3.1). Thus, access to them is more and more dependent on the patient's financial situation. Therefore, Poland has one of the highest percentages in Europe (25.7% of citizens) in terms of unmet medical need related to waiting time for a medical appointment. Several studies proven the association between health spending and increasing life expectancy [Bilas, Franc, Bošnjak, 2014; Chaupain-Guillot, Guillot, 2015; Jakovljevic, Vukovic, Fontanesi, 2016; Linden, Ray, 2017]. Therefore,

in Poland strong governmental investments are needed in order to reach healthy life expectancy at the level of western countries (71.5 years vs. 68.7 years in Poland). Thus, increase of allocation of GDP from 6% to 8% (EU level) on healthcare is desired.

Secondly, the allocation of resources in healthcare system was analysed. Polish system is characterized by the lowest number of health personnel including GPs per 100 thousand inhabitants among all EU countries. There is only 42 GPs and 237 health personnel per 100 thousand inhabitans comparing to almost 102 GPs and 381 health personnel on average in EU per 100 thousand inhabitans. Several studies proved that higher number of general practitioners [Blankart, 2012; Paramita et al., 2020] and higher number of doctors [Hosokawa et al., 2020; Roffia et al., 2023] resulted in higher life expectancy. There are signs of shortages of healthcare professionals in Poland. Therefore, targeted investments in education of higher number of doctors every years is crucial to solve the problem of unmet needs for health care due to long waiting list and improvement of healthy life expectancy.

Thirdly, the number of hospital bed per person in Poland has been well above European averages (617 per 100 thousand people in comparison to the EU average of 532). Majority of CEE countries are characterized by the high number of hospital beds. Some studies showed that higher hospital beds led to better health status [Gillani et al., 2022; Paramita et al., 2020; Roffia et al., 2023]. However, outpatients treatment may represent the similar effectiveness as inpatients care with lower cost of treatment and shorter follow-up period [Driessen et al., 2019; Richter, Diduch, 2017]. Unlike other EU-15 countries, many procedures in Poland are delivered during hospitalization rather than through outpatients clinics. Substitution of inpatient for outpatient care is seen as a way to decrease waiting list, e.g., for surgery [Oh, Perlas, Lau, Gandhi, Chan, 2016]. The traditional work in Poland focused on hospitalization have not changed over the years. Extra attention should be paid to integrate care from hospital care to GP care. According to WHO, there is no well coordination of hospital investments in Poland [WHO et al., 2019b]. Thus, for Polish healthcare system more investments in outpatients sector and reallocation of more procedures is required.

Lastly, the overview of unmet needs for health care due to long waiting list together with healthy life expectancy was made. Poland was assigned to second quadrant which represent countries with lower HALE and higher unmet needs for healthcare due to long waiting list than EU average. In fact, the situation is not positive looking at previously discussed resources (number of health personnel, number of GP and inefficiency in hospital beds management). The health life expectancy in Poland is almost three years lower than EU average while unmet needs for healthcare is 6 p.p. higher than EU average. One in four Poles declare an unmet need for health care due to a long waiting list.

In the face of research limitations regarding the choice of variables for comparing the infrastructure of the health sector between Poland and the EU, it would be appropriate in the future to consider adding variables related to investment in modern medical technologies, such as the use of surgical robots (e.g., the da Vinci robot) or advanced telemedicine systems. Moreover, there is a lack of data on the access to and uptake of modern diagnostic and therapeutic procedures, which can significantly affect the efficiency and competitiveness of the healthcare system. In addition, it would be useful to include indicators related to innovation and the effectiveness of research and development activities in the health sector in the context of the needs of the aging population in EU countries.

3.5. Conclusions

Long-terms strategic vision under one strategy for polish healthcare system should be implemented. Low expenditure on healthcare in Poland is the root cause of many problems in the health system. Besides increasing allocation of public money from GDP on healthcare (from 6% in 2024 to 8% on EU average level), effective education of healthcare professionals is crucial in order to reduce shortages and improve number of GPs and health personnel per capita (from 42 to 100 GPs per 100 thousand inhabitants). Policy actions should be targeted to make healthcare sector more attractive place to work. These shortages contributed significantly to unmet need to long waiting times. In Europe outpatients care cost are equal to inpatients care while polish healthcare system is skewed towards hospital care as a result hospitals consumed majority of health spendings. Thus, strategic decision in terms of reallocation of financial and human resources for some procedures from hospital to outpatients clinic should be taken in order to reduce number of hospital beds or transform them to long-term care beds. Therefore, many patients should get better access to healthcare professional and be more effectively treated. Limited public financing and long waiting time are the main barriers for better access to healthcare. As a result, the three-years gap in health life expectancy between Poland and the average for all EU members states should be eliminated.

The competitiveness of the Polish economy in the area of health is a priority focus for government policy in Poland. Despite the existing infrastructural and investment challenges, Poland is making slow progress in improving the availability of health services, as well as in shaping public health indicators and promoting prevention and healthy lifestyles. To fully capitalize on its competitive potential, Poland should continue to invest in modern medical technologies, increase financial outlays for health care (% of GDP) and invest in medical staff to increase the number of doctors per capita.

Appendix

Table A3.1. Database

Country	Region	Country code	General government expenditure on health (% of GDP)	Domestic private health expenditure (PVT-D) as percentage of current health expenditure (CHE, %)	Number of health personnel (excluding nursing and caring professionals) per 100 thousand inhabitants	Number of GPs per 100 thousand inhabitans	Number of hospital beds per 100 thousand inhabitans	Self-reported unmet needs for health care due to long waiting list (%)	Healthy life expectancy (HALE) at birth (years)
Bulgaria	CEE	BG	5.9	38.1	427.7	60.2	774.1	4.9	66.3
Croatia	CEE	HR	7.3	18.1	352.2	77.1	566.5	26.3	68.6
Czechia	CEE	CZ	9.2	12.6	409.5	66.5	658.0	14.2	68.8
Estonia	CEE	EE	6.7	22.9	347.9	81.5	453.0	25.6	69.2
Hungary	CEE	HU	6.4	28.9	313.9	66.0	690.8	13.3	67.2
Lithuania	CEE	LT	5.9	30.8	448.3	97.6	634.7	19.7	66.7
Latvia	CEE	LV	4.8	36.4	333.9	74.5	542.3	25.6	66.2
Poland	CEE	PL	5.4	28.0	237.8	41.9	617.5	25.7	68.7
Romania	CEE	RO	5.5	19.8	333.0	78.6	705.8	3.6	66.8
Slovenia	CEE	SI	7.9	27.2	330.3	69.0	443.2	22.8	70.7
Slovakia	CEE	SK	6.3	19.7	366.9	43.3	576.1	7.1	68.5
Cyprus	CEE	CY	5.9	21.5	427.2	95.5	311.5	3.3	72.4
Austria	EU-15	AT	9.1	23.6	534.7	148.9	718.9	20.4	70.9
Belgium	EU-15	BE	8.8	20.8	321.3	118.7	556.7	6.9	70.6
Denmark	EU-15	DK	9.0	15.1	425.1	79.8	259.3	24.5	71.0
Finland	EU-15	FI	7.7	18.7	348.0	135.2	334.6	24.7	71.0
France	EU-15	FR	9.0	23.3	318.1	139.5	583.8	23.9	72.1
Germany	EU-15	DE	8.5	21.6	446.8	102.8	791.5	21.3	70.9
Greece	EU-15	EL	6.7	45.9	262.3	44.1	418.0	12.5	70.9
Ireland	EU-15	IE	5.4	21.2	345.6	187.7	288.0	18.3	71.1
Italy	EU-15	IT	7.9	23.9	400.1	84.7	316.3	25.2	71.9
Luxembourg	EU-15	LU	5.9	11.5	298.5	89.6	426.5	35.8	71.6
Malta	EU-15	MT	7.2	33.3	418.8	80.5	410.3	17.0	71.5
Netherlands	EU-15	NL	8.3	31.2	383.4	178.0	307.8	17.5	71.4
Portugal	EU-15	PT	7.2	35.5	460.0	292.3	350.6	29.5	71.0
Spain	EU-15	ES	7.6	26.7	457.7	91.4	294.6	13.1	72.1

cont. Table A.1

Country	Region	Country code	General government expenditure on health (% of GDP)	Domestic private health expenditure (PVT-D) as percentage of current health expenditure (CHE, %)	Number of health personnel (excluding nursing and caring professionals) per 100 thousand inhabitants	Number of GPs per 100 thousand inhabitans	Number of hospital beds per 100 thousand inhabitans	Self-reported unmet needs for health care due to long waiting list (%)	Healthy life expectancy (HALE) at birth (years)
Sweden	EU-15	SE	7.3	14.1	428.5	62.1	207.1	24.4	71.9
CEE	CEE	CEE	6.1	25.0	316.0	59.6	645.0	16.5	68.0
EU-15	EU-15	EU-15	8.2	24.3	400.2	114.9	498.9	20.8	71.5
EU-27*	EU-27	EU-27	8.0	24.5	381.2	102.3	532.0	19.4	70.9

* From 2020.

Source: own elaboration.

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Chapter 4

Foreign Capital Activity in Poland and Polish Foreign Investment with a Focus on Health-Related Industries

Tomasz Marcin Napiórkowski

4.1. Introduction

As researchers addressing the topic of economic growth based on endogenously developed technology have pointed out [Romer, 1990; Aghion, Howitt, 1992], human capital is one of the key factors needed to build long-term economic growth [Hippe, 2020]. Some indices representing the stock of human capital focus on education [University of Groningen, 2023; Feenstra, Inklaar, Timmer, 2015], but education is only one of the elements defining human capital. According to the OECD, human capital should be understood as "the stock of knowledge, skills and other personal characteristics embodied in people that helps them to be productive" [OECD, 2023a]. The World Bank describes human capital as the sum of "the knowledge, skills, and health that people accumulate throughout their lives, enabling them to realize their potential as productive members of society" [World Bank, 2023a]. Therefore, human capital represents the quality of an employee (resulting from their knowledge and skills), for which health acts as a multiplier determining the scale of the use of this quality (4.1).

$$Human\ capital = Health * f(Knowledge, Skills) \tag{4.1}$$

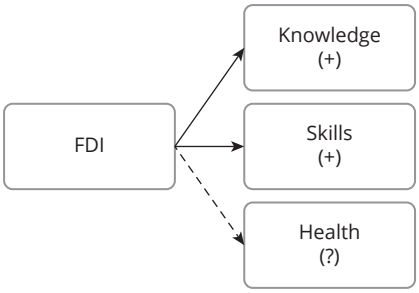
This approach emphasises the role of health in human capital, because when health deteriorates, the ability to use the knowledge and skills of the employee is also reduced. In extreme cases, where health takes the value zero, the knowledge and skills of the employee – from the perspective of an economy using human capital as a factor of production – become irrelevant.

Hosting foreign direct investment (FDI) involves the transfer of knowledge [Tülüce, Doğan, 2014; Perri, Peruffo, 2016; Burinskas, Holmen, Tvaronavičienė, Šimelytė, Razminienė, 2021], which is the first of the three elements of human capital. This

transfer is not automatically fully absorbed by the host economy, as the capacity to absorb it (i.e., to understand and use it) [Apriliyanti, Alon, 2017; Napiórkowski, 2017] is required. Hosting foreign direct investment is also associated with increased wages [Lipsey, 2002; Tomohara, Takii, 2011], driven by the desire of foreign investors to attract the best employees and build positive social relations. Higher wages (assuming price elasticity of labour supply) will increase the stock of workforce who increase their skill level through knowledge transfer and the performance of new tasks (learning-by-doing) [Romer, 1986]. Therefore, hosting FDI is associated with raising the level of the two human capital elements: knowledge and skills.

However, the question remains whether the analysed investment in healthcare and social assistance contributes to the last element of human capital, i.e., health (Figure 4.1). The aim of this chapter is to find an answer to this question using the example of Poland.

Figure 4.1. Illustration of the research objective linking the hosting of foreign direct investment to human capital accumulation



Source: own elaboration.

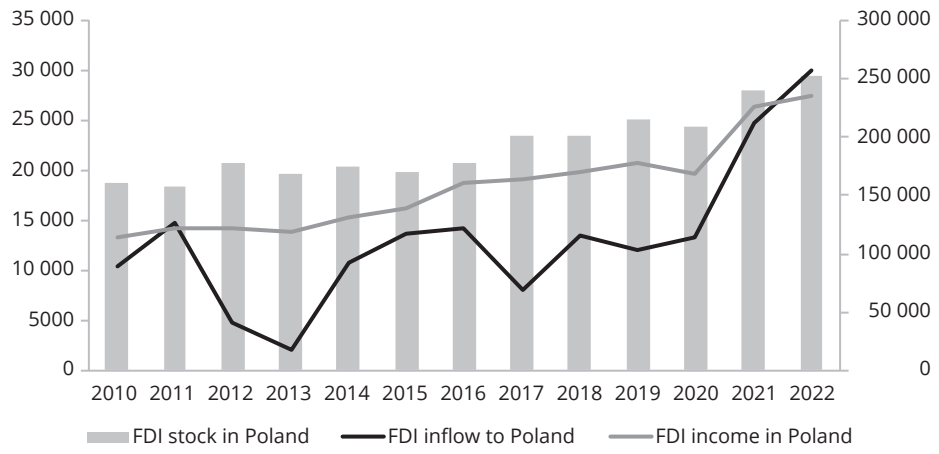
Secondary data on foreign direct investment from the National Bank of Poland [2023a, 2023b] and data from the World Bank [2023b] on health represented by life expectancy at birth and mortality will be used to achieve the stated objective. Data analysis will be performed using trend and correlation analysis.[1] Prior to the above analysis, a presentation of the status quo of foreign direct investment from and to Poland will be made, distinguishing healthcare and social assistance investment.

[1] Time series that is too short and lack of data at the sub-national level (e.g., NUTS2) prevented the use of econometric modelling.

4.2. Analysis of data on foreign direct investment in and from Poland – including the area of healthcare and social assistance

Foreign direct investment (FDI) flows, stocks and income in Poland are marked by strong upward trends (Figure 4.2). In 2022, FDI flows amounted to EUR 29 931.1 million (up by 21.08% y/y), stocks to EUR 251 554.3 million (up by 4.68% y/y) and income to EUR 27 506.6 million (up by 4.29% y/y). In the same year, Polish foreign direct investment (PFDI) reached very high growth rates. Flows increased by 124.56% y/y (to EUR 6015.7 million), stocks by 15.18% (to EUR 27 836.1 million) and income by 82.73% (to EUR 6233.5 million, Figure 4.3). Therefore, direct investors from Poland have increased their presence in international markets to a greater extent than foreign investors have increased their presence in Poland. In addition, while in the case of FDI income has grown at a rate almost equal to the growth in FDI stocks, in the case of PFDI income has grown at about 4.5 times the level of stocks.

Figure 4.2. Flows, income (left axis) and stocks (right axis) of foreign direct investment in Poland in 2010–2022 (EUR millions)

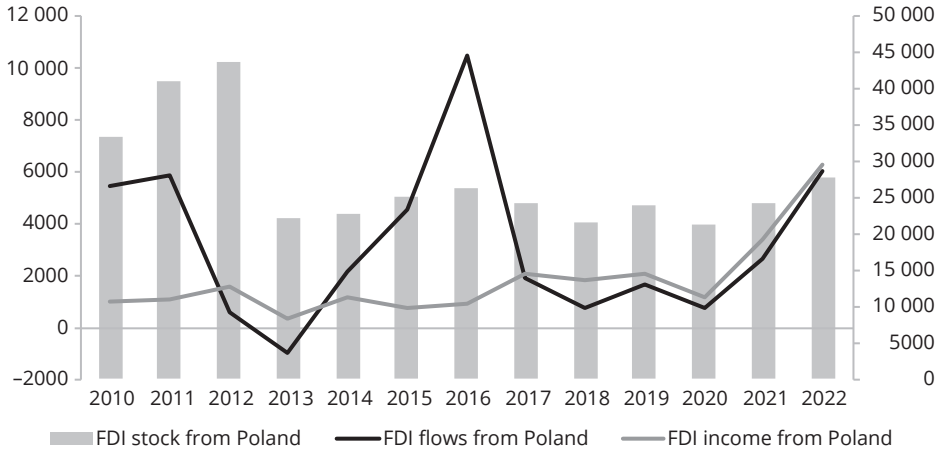


Source: own elaboration based on NBP [2023a, 2023b] data.

The flows, stocks and income associated with the activity of foreign investors in Poland in healthcare and social assistance – FDI (H) – account for a very small share of the overall FDI values (around 0.5%), but each of these shares has an upward trend, suggesting that the analysed industry in Poland is becoming increasingly attractive to foreign investors (Table 4.1). The same cannot be said for the activity of Polish investors

abroad – PFDI (H) – where a decline in investment exposure is evident, accompanied by a decline in income – PFDI investors have recorded continuous losses since 2019 (Table 4.2).

Figure 4.3. Flows, income (left axis) and stocks (right axis) of Polish foreign direct investment in 2010–2022 (EUR millions)



Source: own elaboration on NBP [2023a, 2023b] data.

Table 4.1. Share of healthcare and social assistance – FDI (H) – flows, stocks and income in the overall FDI values for each category in 2010–2022 (%)

Category/ Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Flows	−0.03	0.04	0.04	−10.29	0.44	0.50	0.33	0.51	0.52	1.49	0.72	0.60	−0.07
Stocks	0.12	0.15	0.12	0.37	0.37	0.43	0.41	0.40	0.42	0.49	0.50	0.49	0.45
Income	0.05	−0.13	0.09	−0.04	0.11	0.17	0.17	0.25	0.25	0.16	0.51	0.65	0.31

Notes: green indicates high values, while red indicates low values.

Source: own elaboration based on NBP [2023a, 2023b] data.

Table 4.2. Share of Polish healthcare and social assistance – PFDI (H) – flows, stocks and income in the overall FDI values for each category in 2010–2022 (%)

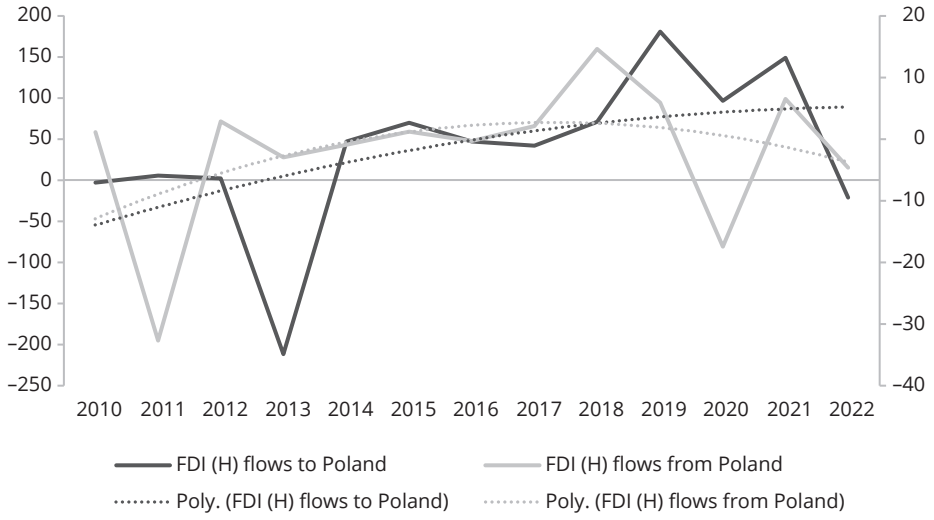
Category/ Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Flows	0.02	−0.56	0.50	0.30	−0.04	0.03	0.00	0.11	1.93	0.36	−2.34	0.24	−0.08
Stocks	0.01	0.01	0.01	0.01	0.01	0.02	0.02	−0.03	0.08	0.10	0.14	−0.06	0.06
Income	0.00	0.04	0.05	0.10	−0.06	−0.12	−0.11	0.02	0.08	−0.03	−0.07	−0.18	−0.03

Notes: green indicates high values, while red indicates low values.

Source: own elaboration based on NBP [2023a, 2023b] data.

For both flows (Figure 4.2) and stocks (Figure 4.3) of foreign direct investment in healthcare and social assistance, Poland is a net recipient. From 2014, FDI (H) and PFDI (H) flows followed an upward trend, which slowed in the case of FDI (H) and even reversed in the case of PFDI (H) (around 2017). While at the beginning of the analysed period, the stocks of Polish investors in the healthcare and social assistance industry were higher than those of foreign investors in Poland, this relationship was reversed after 2013. The stocks of foreign investors in the healthcare and social assistance sector in Poland were steadily accumulating, while the stocks of Polish direct investors abroad in this area were more volatile, which is particularly evident between 2020 and 2022.

Figure 4.4. Flows of foreign direct investment to (left axis) and from (right axis) Poland in 2010–2022 (EUR millions)

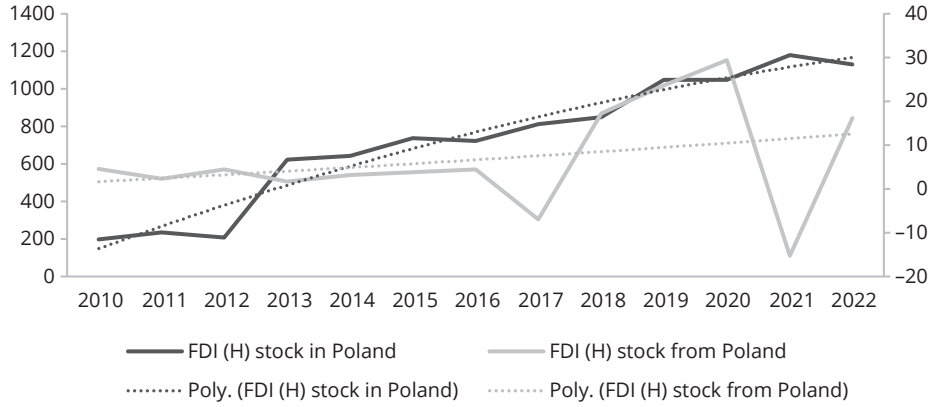


Source: own elaboration based on NBP [2023a, 2023b] data.

Like FDI (H) stocks, the related income followed an upward trend that intensified after 2019, while Polish investors experienced losses or relatively insignificant profits (Figure 4.4). As with flows and stocks, the COVID-19 pandemic should be considered a key source of the observed variance in the period 2020–2022 [Napiórkowski, 2022a, 2022b].

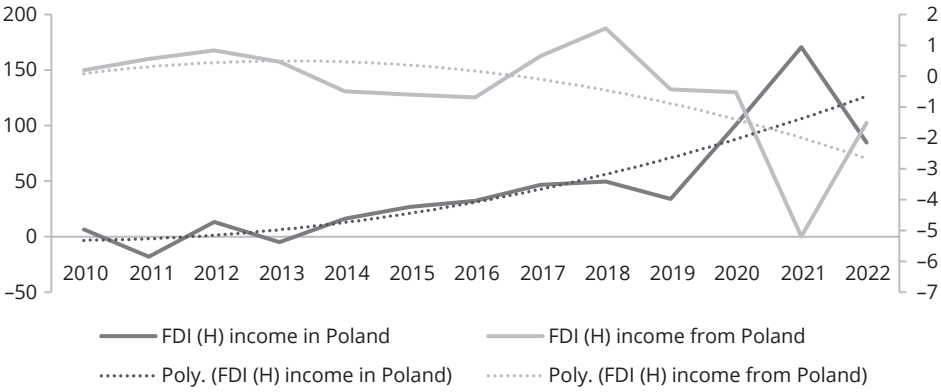
The data presented above shows that the healthcare and social assistance sector plays a marginal role in the activity and income of foreign investors in Poland and Polish investors abroad. This role is increasing for investors from abroad and decreasing for investors from Poland.

Figure 4.5. Stocks of foreign direct investment in (left axis) and from (right axis) Poland in 2010–2022 (EUR millions)



Source: own elaboration based on NBP [2023a, 2023b] data.

Figure 4.6. Income related to foreign direct investment to (left axis) and from (right axis) Poland in 2010–2022 (EUR millions)



Source: own elaboration based on NBP [2023a, 2023b] data.

4.3. Investment in healthcare and social assistance vs. health

Foreign direct investment can have a positive effect on health in the host country due to the offering of higher wages, better (safer) working conditions, and better social assistance, but also a negative effect due to increased stress levels resulting from increased competition or redundancies associated with merger and acquisition

processes [Herzer, Nunnenkamp, 2012]. Immurana [2020] proved that hosting FDI had a positive impact on health (life expectancy and mortality) in Africa. The health benefits of hosting FDI for low- and middle-income countries are also identified by Burns, Jones, Goryakin and Suhrcke [2017], which is in line with the results, e.g., of Golkhandan [2017] – while it should be marked that, depending on the secondary sector, the impact shows the potential to be negative. The positive impact of FDI on health was also observed by Chiappini, Coupaud and Viaud [2022], while highlighting that this positive impact diminishes as GDP per capita of the host country increases. Interestingly, in the case of developed countries, FDI may even have a negative impact on health [Herzer, Nunnenkamp, 2012], which may be related to the over-privatisation of this sector of the economy. Also, the correlation between health (as an element of human infrastructure) and FDI can go both ways, i.e., the health of the population not only partly results from FDI, but also attracts it [Giammanco, Gitto, 2019; Immurana, 2021]. In his review of literature, Smith [2004] points out that the actions taken by the national regulatory community determine the impact of FDI both on economic aspects and on health in the host country. The author also highlights the recognition of the potential negative effects of the commercialisation of the healthcare market through foreign investment. In view of the results of the studies cited above and Poland's classification as a developed country [OECD, 2023b], the answer to the question posed at the beginning of this chapter about the correlation between FDI and health in Poland can be expected to be negative.

To test whether there is a correlation between foreign direct investment and the level of health in Poland, investment will be represented by its stocks, and health by life expectancy at birth[2] and mortality.[3, 4]

While the FDI stocks in the area of healthcare and social assistance follow a virtually continuous upward trend ($R^2 = 93.25$), the level of health represented by life expectancy is best described by a parabola with a maximum in 2015–2016 ($R^2 = 85.74$; Figure 4.4). The lack of a statistically significant correlation between the analysed processes is also confirmed by correlation analysis, for which (for example due to the number of observations) [Napiórkowski, 2022c] the non-parametric correlation coefficients: Spearman's *rho* (p-value = 0.872) and Kendall's *tau* (p-value = 0.760) were used.

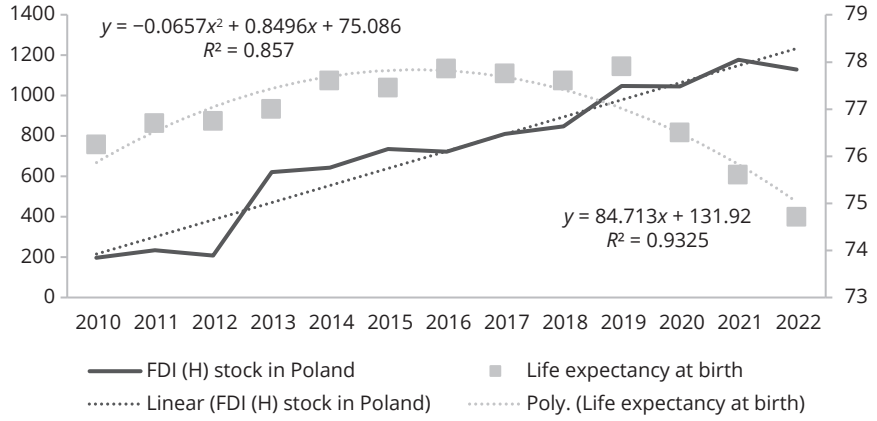
[2] "Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life" [World Bank, 2023b].

[3] "Crude death rate indicates the number of deaths occurring during the year, per 1000 population estimated at midyear" [World Bank, 2023b].

[4] Due to lack of data, the 2022 data points for the variables 'life expectancy at birth' and 'mortality' were estimated based on the assumption that the change between 2021 and 2022 is the same as for the period 2020–2021. Such a small-scale imputation should not affect the overall relationship between the variables examined.

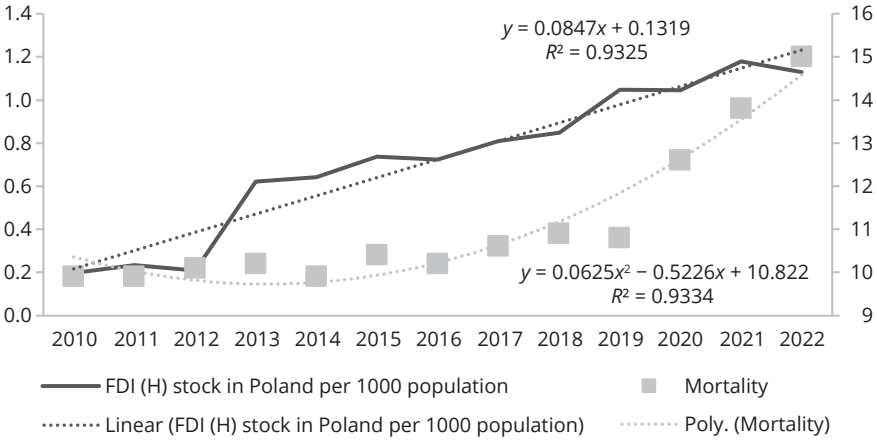
However, the situation is different when health is represented by mortality, where both measured processes (expressed per 1000 population) clearly increase over time (Figure 4.5), which – as well as the correlation results (Spearman's *rho*: p-value < 0.001; Kendall's *tau*: p-value < 0.001) – suggests a link between the two.

Figure 4.7. Healthcare and social assistance FDI stocks in Poland (left axis, EUR millions) and life expectancy at birth (right axis, years)



Source: own elaboration based on NBP [2023b] and World Bank [2023b] data.

Figure 4.8. Healthcare and social assistance FDI stocks in Poland per 1000 population (left axis, EUR millions) and mortality per 1000 population (right axis, persons)



Source: own elaboration based on NBP [2023b] and World Bank [2023b] data.

4.4. Conclusions

The aim of this chapter was to examine whether foreign direct investment in healthcare and social assistance helps to improve the level of health in Poland. A review of literature revealed that for low- and middle-income countries, such a relationship exists, but it becomes less evident the wealthier the host country is.

Bearing in mind that Poland is classified as a developed economy, the results obtained by means of trend and correlation analysis regarding the lack of correlation between the analysed processes when health is measured by life expectancy are consistent with the literature. When health was measured by its de facto opposite, i.e., mortality, the trend and correlation analysis showed a statistically significant and positive correlation. This result is surprising, because Poland, even as a developed country, is not ranked among the top countries in terms of income, so the results of Herzer's and Nunnenkamp's [2012] research do not apply in this case. A more detailed analysis of the Figure 4.6 shows that the mortality rate starts to increase sharply after 2019 and it is precisely this increase that produces the correlation result obtained. The conclusion that this correlation is spurious is also supported by the fact that foreign investment in Poland in the area of healthcare and social assistance is too low (compared to total) to have a real impact on the level of health in Poland. The identified correlation between FDI (H) and mortality can therefore be regarded as coincidental.

As the time series is short, it is not possible to use more sophisticated econometric tools to monitor other potential processes that are complementary to FDI in determining the level of health in Poland (e.g., the scale of privatisation). The above results also show that a multi-indicator approach is necessary when analysing aspects such as health that cannot be expressed by a single measure.

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Chapter 5

Poland's Foreign Trade with a Focus on the Health Sector

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5.1. Introduction

Healthcare is one of the most strategically important sectors of the global economy [Weresa, 2022], and the resilience of healthcare value chains came to the forefront of scientific discourse during the COVID-19 pandemic [Baldwin, Evenett, 2020; Gereffi, Pananond, Pedersen, 2022; Spieske, Gebhardt, Kopyto, Birkel, 2022]. This study aims to explore Poland's foreign trade, with focus on the health sector and products, by investigating five research questions:

1) What is Poland's current account balance?
2) What does Poland export and import?
3) Who are Poland partners?
4) What is Poland's position in pharmaceutical goods?
5) What is the level of migration of Poland's healthcare professionals?

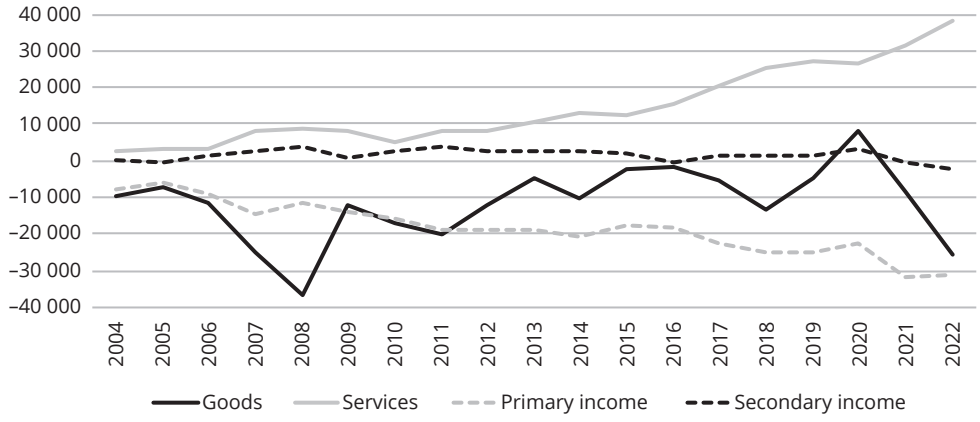
The chapter is made up of seven sections. After the introductory remarks, section two explores the current account balance of Poland. Section three analyses Poland's revealed comparative advantage, and section four details its foreign trade and important partners. Section five focuses on trade in pharmaceutical products, including vaccines for human medicine, while section six provides information on the international migration of healthcare professionals. Section seven concludes the study.

The methodology is based on a literature review and comparative empirical analysis of Poland and other selected economies. The empirical analysis is based on data from international databases [IMF, 2023; ITC, 2023; OECD, 2023c; World Bank, 2023] and the National Bank of Poland [NBP, 2023]. Global export and import values are not equal due to data mirroring issues, which are well-known in macroeconomics. For an explanation of this phenomenon see the OECD's [2023a, 2023d] website.

5.2. Poland's current account balance

The current account balance deficit is largely determined by the balance of trade, and a trade deficit occurs when a country's imports exceed its exports. Factors that increase current account deficits include economic growth, trade openness, institutional quality, and financial and economic development [Altayligil, Çetrez, 2020; Behera, Yadav, 2019; Yurdakul, Ucar, 2015]. In many cases, a current account balance deficit seems almost inevitable and does not harm the economy if it remains relatively low compared to the size of the market. A situation like this is not uncommon among successful developed nations, as rich societies can consume more and tend to move their manufacturing abroad. The current account deficit of the United States has historically been widely discussed due to the global importance of its economy [Bernanke, 2005; Blanchard, 2007; Summers, 2004].

Figure 5.1. Poland's balance of payments (current account) in 2004–2022 (USD millions)



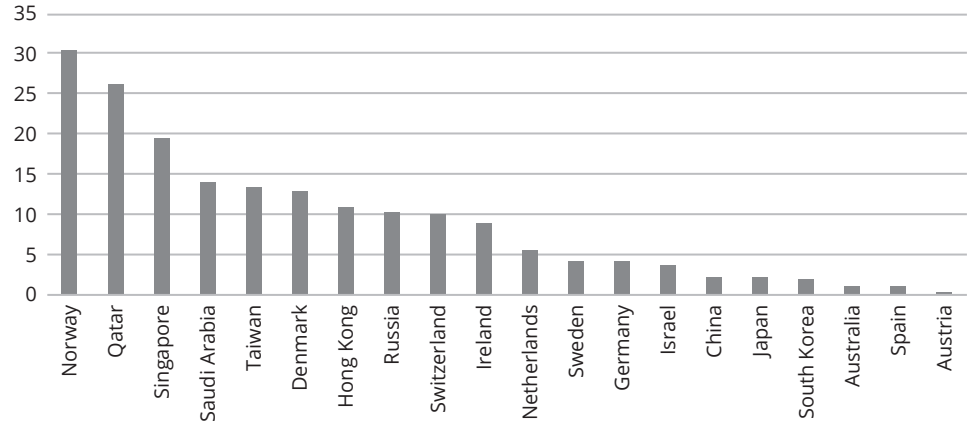
Source: NBP [2023].

In Poland, as shown below, the trade deficit is quite persistent. Figure 5.1 shows the current account balance of Poland. In the analysed period, Poland predominantly ran a current account deficit and a trade in goods deficit. In 2004, the current account was at USD −15.3 billion. Since then, the current account balance was positive only once, in 2020 (USD 14.8 billion), driven by a surplus in trade in goods (USD 8.1 billion). The current account balance dropped below zero again in 2021 (USD −9.6 billion) and in 2022 (USD −20.8 billion). In 2022, three of the four components of the current account had negative values. Specifically, these were goods (balance: USD −25.5 billion, export: USD 336.8 billion, import: USD 362.4 billion), primary

income (balance: USD −31.3 billion, credit: USD 14.8 billion, debit: USD 46.1 billion), and secondary income (balance: USD −2.2 billion, credit: USD 11.2 billion, debit: USD 13.4 billion). The only component with a positive balance was services (balance: USD 38.3 billion, credit: USD 95.7 billion, debit: USD 57.3 billion). In fact, Poland's services have consistently run a surplus every year since 2004, and a surplus exceeding USD 20 billion since 2017.

Current account surplus is often associated with the dominant position of exporters, especially those rich in natural resources (Figure 5.2). Of those selected, Norway (30.4% of GDP) had the largest current account surplus as expressed by a percentage of its gross domestic product, followed by Qatar (26% of GDP), Singapore (19.3% of GDP), Saudi Arabia (13.8% of GDP), and Taiwan (13.4% of GDP). The list also includes large economies that have historically been based on global exports, such as Germany (4.2% of GDP), China (2.3% of GDP), and Japan (2.1% of GDP).

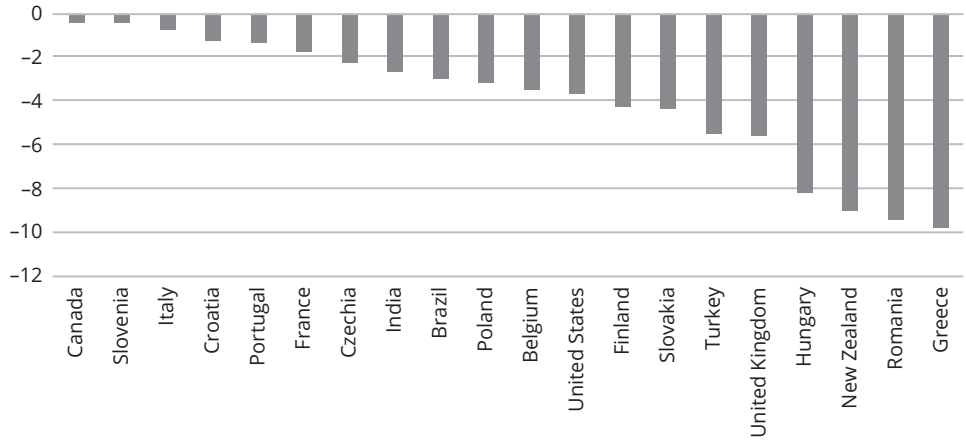
Figure 5.2. Current account balance of selected economies with current account surplus in 2022 (% of GDP)



Source: IMF [2023].

Many developed economies have current account deficits (Figure 5.3). According to data, the economies with the largest deficit included Greece (−9.7% of GDP), Romania (−9.3% of GDP), New Zealand (−8.9% of GDP), Hungary (−8.1% of GDP), and the United Kingdom (−5.6% of GDP). Poland's deficit (−3.2% of GDP) was similar in relative size to that of Belgium (−3.4% of GDP) and the United States (−3.6% of GDP).

Figure 5.3. Current account balance of selected economies with current account deficit in 2022 (% of GDP)



Source: IMF [2023].

5.3. Poland's revealed comparative advantage

Table 5.1 explores the revealed comparative advantage (RCA) of Poland's (reporter) exports to the world (partner). The World Bank defines RCA of a country for product j as $RCA_{ij} = (x_{ij}/X_{it})/(x_{wj}/X_{wt})$, where x_{ij} is the country's export of the analysed product, X_{it} is the country's total export, x_{wj} is the world export of the analysed product, and X_{wt} is the world total export [World Bank, 2023]. If RCA is higher than one, the country has a revealed comparative advantage for product j. The table includes the five most recent years, the year of Poland's accession to the European Union [2004], and the earliest year with available data (1994). There have been drastic changes in the economic development of Poland since 1994, which is reflected in the evolution of its RCA of different products. Product groups with the lowest RCA in 2020 were minerals (0.14), fuels (0.16), raw materials (0.54), stone and glass (0.58), chemicals (0.67), and hides and skins (0.67). On the other hand, the highest RCA in 2020 was observed for food products (2.33), wood (2.32), animal (1.98), plastic or rubber (1.44), and consumer goods (1.41). Comparing the 2020 values to 1994, the most significant drop was noted for minerals (from 2.74 to 0.14), falling from the top rank to the very bottom.

Table 5.1. Poland's revealed comparative advantage in 1994–2020

Product group	1994	2004	2016	2017	2018	2019	2020
Food products	0.84	1.38	2.10	2.21	2.32	2.31	2.33
Wood	1.50	1.92	2.27	2.23	2.33	2.34	2.32
Animal	1.62	1.62	2.08	2.29	2.35	2.17	1.98
Plastic or rubber	0.56	1.15	1.48	1.51	1.54	1.52	1.44
Consumer goods	1.29	1.34	1.40	1.38	1.38	1.36	1.41
Metals	2.53	1.59	1.44	1.45	1.40	1.43	1.39
Transportation	0.62	1.27	1.26	1.32	1.40	1.37	1.36
Miscellaneous	0.89	1.38	1.23	1.36	1.42	1.38	1.33
Footwear	1.05	0.50	0.54	0.60	0.65	0.79	1.00
Mach and elec	0.38	0.82	0.90	0.89	0.91	0.92	0.91
Capital goods	0.37	0.79	0.87	0.89	0.92	0.94	0.91
Intermediate goods	1.46	1.05	0.79	0.85	0.83	0.83	0.77
Vegetable	0.87	0.75	0.85	0.71	0.73	0.74	0.73
Textiles and clothing	2.12	0.90	0.67	0.66	0.62	0.70	0.71
Hides and skins	0.79	0.65	0.89	0.86	0.77	0.73	0.67
Chemicals	0.73	0.58	0.73	0.72	0.69	0.69	0.67
Stone and glass	0.93	0.86	0.54	0.55	0.60	0.62	0.58
Raw materials	1.25	0.58	0.59	0.53	0.49	0.49	0.54
Fuels	1.24	0.47	0.24	0.22	0.19	0.17	0.16
Minerals	2.74	0.40	0.16	0.15	0.19	0.15	0.14

Source: World Bank [2023].

5.4. Poland's foreign trade and important partners

Table 5.2 shows Poland's leading exports and imports by product at the HS-2 level. According to the 2022 value, pharmaceutical products were Poland's 18th most important exported product, at USD 4.8 billion (1.3% of total export). When it comes to imported products, pharmaceuticals were ranked 8th, at USD 8.4 billion (2.4% of total export). Poland's trade deficit in pharmaceutical products stood at USD −3.8 billion.

Table 5.2. Poland's foreign trade by product in 2022

HS code	Products	Value (USD thousands)
Poland's export		
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	46 089 488
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television (...)	42 143 103
87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	30 304 516
39	Plastics and articles thereof	18 221 247
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral (...)	13 660 003
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings (...)	12 087 656
73	Articles of iron or steel	11 984 545
72	Iron and steel	8 070 992
2	Meat and edible meat offal	7 933 206
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	7 030 093
40	Rubber and articles thereof	6 544 937
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical (...)	6 539 643
76	Aluminium and articles thereof	6 092184
44	Wood and articles of wood; wood charcoal	5 744 086
74	Copper and articles thereof	5 503 613
61	Articles of apparel and clothing accessories, knitted or crocheted	5 365 546
62	Articles of apparel and clothing accessories, not knitted or crocheted	4 696 694
30	Pharmaceutical products	4 591 856
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	4 518 394
24	Tobacco and manufactured tobacco substitutes; products, whether or not containing nicotine (...)	4 440 611
Total	**All products**	**342 844 658**
Poland's import		
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	41 773 936
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral (...)	37 617 311
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television (...)	36 504 226
87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	26 917 807
39	Plastics and articles thereof	20 804 349

HS code	Products	Value (USD thousands)
99	Commodities not elsewhere specified	16 932 173
72	Iron and steel	16 062 321
30	Pharmaceutical products	8 431 505
73	Articles of iron or steel	8 017 018
76	Aluminium and articles thereof	7 327 312
61	Articles of apparel and clothing accessories, knitted or crocheted	7 082 219
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	7 079 543
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical (...)	6 587 779
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals (...)	5 758 223
62	Articles of apparel and clothing accessories, not knitted or crocheted	5 434 159
38	Miscellaneous chemical products	5 286 980
29	Organic chemicals	5 237 335
40	Rubber and articles thereof	5 017 340
64	Footwear, gaiters and the like; parts of such articles	4 062 365
95	Toys, games and sports requisites; parts and accessories thereof	3 736 394
Total	**All products**	**358 592 597**

Source: ITC [2023].

Table 5.3 lists the most important trade partners of Poland. In 2022, Poland exported primarily to European economies, such as Germany (USD 95.2 billion), Czechia (USD 22.7 billion), France (USD 19.7 billion), the United Kingdom (USD 16.5 billion), and the Netherlands (USD 15.9 billion). The most significant sources of Poland's import were Germany (USD 75 billion), China (USD 47.1 billion), Italy (USD 16.7 billion), Russia (USD 16.7 billion), and the United States (USD 15.8 billion). Poland had a large surplus in trade with Germany (USD 20.2 billion), and deficits with China (USD −44.1 billion), Russia (USD −11.8 billion), and the United States (USD −5.8 billion). In 2022, the value of Poland's export to Russia decreased by 45.2% compared to 2021, while the value of Poland's import from Russia decreased by 17.2%. In general, the list of important trade partners that Poland imports from is more globalised than the list of markets for Polish exports.

Table 5.3. Poland's foreign trade by partner in 2021–2022

Partner	Poland's export (USD thousands)		Partner	Poland's import (USD thousands)	
	2021	2022		2021	2022
Germany	91 052 397	95 223 163	Germany	70 635 849	75 023 998
Czechia	19 029 902	22 650 326	China	49 662 974	47 122 801
France	18 109 267	19 696 427	Italy	16 750 365	16 682 387
United Kingdom	16 137 559	16 490 587	Russia	20 114 279	16 653 277
Netherlands	13 801 304	15 918 463	United States	10 371 595	15 831 940
Italy	14 125 728	15 802 478	Netherlands	13 714 264	13 362 592
United States	8 682 724	10 033 013	Czechia	10 725 393	11 130 828
Slovakia	8 085 895	9 968 420	France	11 240 695	10 805 479
Ukraine	7 054 558	9 704 531	South Korea	7 651 276	8 795 961
Sweden	8 754 658	9 195 616	Belgium	7 036 833	7 061 643
Spain	7 776 766	8 859 783	Spain	7 258 295	6 925 208
Hungary	7 993 459	8 825 076	United Kingdom	5 401 028	6 555 132
Belgium	8 015 422	8 704 668	Sweden	5 538 256	6 235 505
Austria	7 223 338	7 673 593	Ukraine	5 041 755	6 224 385
Romania	6 401 917	7 199 600	Turkey	6 157 195	6 169 972
Lithuania	5 311 792	6 041 031	Saudi Arabia	2 524 624	6 013 094
Denmark	5 168 607	5 806 446	Slovakia	6 342 915	5 813 200
Russia	8 789 388	4 818 832	Hungary	5 098 008	5 172 035
Switzerland	3 209 613	3 638 896	Austria	5 349 172	5 152 097
Turkey	2 929 408	3 630 742	Japan	5 076 926	5 119 384
World	**317 832 125**	**342 844 658**	**World**	**335 451 322**	**358 592 597**

Source: ITC [2023].

5.5. Foreign trade in pharmaceutical products

Table 5.4 ranks the most important countries according to the value of foreign trade in pharmaceutical products (HS 30). In 2022, pharmaceutical products were predominantly exported by Germany (USD 124.1 billion), Belgium (USD 103.3 billion), Switzerland (USD 98.1 billion), the United States (USD 83.5 billion), Ireland (USD 75.6 billion), and Italy (USD 50.9 billion). The largest importers were the United States (USD 165 billion), Belgium (USD 80 billion), Germany (USD 79.4 billion), Switzerland (USD 48.7 billion), China (USD 39.9 billion), and Japan (USD 39.3 billion). With regard to the top-ranked economies, there is a large degree of intra-industry trade.

Poland was the 22nd largest exporter (USD 4.6 billion) and the 20th largest importer (USD 8.4 billion).

Table 5.4. Largest exporters and importers of pharmaceutical products

Exporter	Export (USD thousands)		Importer	Import (USD thousands)	
	2021	2022		2021	2022
Germany	118 060 851	124 128 671	United States	149 410 420	164 993 417
Belgium	97 725 436	103 321 111	Belgium	69 469 299	80 010 170
Switzerland	101 583 419	98 114 783	Germany	79 293 902	79 434 183
United States	77 849 066	83 492 755	Switzerland	42 263 869	48 719 814
Ireland	67 539 520	75 562 672	China	41 858 422	39 908 670
Italy	36 715 910	50 880 406	Japan	37 507 878	39 320 553
France	39 117 355	37 681 146	Italy	30 829 218	37 117 236
Netherlands	37 185 688	28 572 364	United Kingdom	27 047 223	33 145 429
Spain	20 196 767	28 098 250	France	34 039 518	32 418 299
United Kingdom	26 088 378	27 948 884	Netherlands	25 588 420	23 968 590
Denmark	19 444 269	19 900 475	Spain	24 675 680	23 785 068
India	19 460 516	19 752 792	Canada	18 479 195	20 003 840
Slovenia	9 676 149	15 324 708	Russia	13 779 230	13 812 559
China	38 552 225	14 004 896	Australia	10 758 190	13 003 071
Austria	14 423 860	13 768 916	Ireland	10 936 722	11 615 766
Sweden	11 237 549	13 253 269	South Korea	10 435 581	10 995 436
Canada	9 558 439	10 748 125	Austria	10 782 022	10 128 411
Singapore	10 268 877	9 842 829	Brazil	11 006 232	9 917 556
Japan	7 572 612	7 493 925	Slovenia	6 557 358	9 004 826
Hungary	7 068 800	7 013 757	Poland	8 295 300	8 431 505
South Korea	8 438 615	6 632 071	Taiwan	5 295 166	7 297 731
Poland	3 433 736	4 591 856	Czechia	7 309 001	7 025 331
World	**827 894 593**	**843 989 489**	**World**	**860 103 359**	**884 902 951**

Source: ITC [2023].

In the last two years, Poland had a large deficit in trade in pharmaceutical products (Table 5.5), mostly exporting to Germany (USD 794.1 million), Russia (USD 368.7 million), France (USD 241.5 million), Czechia (USD 228.4 million), and the United Kingdom (USD 226.8 million). Poland's imports were significantly higher; the list was led by Germany (USD 1.6 billion), followed by the United States (USD 1.2 billion), Ireland (USD 534 million), Italy (USD 527.9 million), and France (USD

495.7 million). Poland's trade deficit in 2022 (USD −3.8 billion) was lower than in 2021 (USD −4.9 billion).

Table 5.5. Poland's foreign trade in pharmaceutical products by partner

Partner	Poland's export (USD thousands)		Partner	Poland's import (USD thousands)	
	2021	2022		2021	2022
Germany	624 952	794 123	Germany	1 574 132	1 601 587
Russia	337 704	368 677	United States	1 154 603	1 163 838
France	137 614	241 547	Ireland	585 629	534 027
Czechia	203 238	228 441	Italy	465 587	527 942
United Kingdom	136 855	226 845	France	550 786	495 669
Italy	151 286	202 579	Hungary	359 977	381 693
Belgium	72 481	187 670	Switzerland	405 885	372 601
Hungary	98 504	184 765	Netherlands	285 757	370 527
Spain	116 972	181 669	Denmark	310 761	322 883
Denmark	170 286	161 371	United Kingdom	331 162	288 602
Romania	97 245	158 457	Austria	264 645	276 146
Lithuania	124 501	111 142	China	210 085	229 650
Ukraine	97 657	106 506	Slovenia	235 193	229 174
Sweden	77 133	99 178	Spain	186 482	216 939
Netherlands	47 411	89 131	India	107 634	139 721
Kazakhstan	86 742	79 324	Greece	106 929	123 910
Norway	75 964	78 078	Belgium	118 671	112 726
Switzerland	42 208	77 581	Czechia	110 566	98 392
China	38 783	70 426	Canada	48 175	77 331
Canada	8428	68 083	Turkey	57 557	65 685
World	**3 433 736**	**4 591 856**	**World**	**8 295 300**	**8 431 505**

Source: ITC [2023].

Table 5.6 limits the scope of the analysis only to Poland's export and import of vaccines for human medicine (HS 300220), and in contrast to the previous tables, this data is based on the year 2020 (the latest available for Poland). Like in the case of all pharmaceutical products, Poland had a trade deficit in vaccines for human medicine (USD −105.3 million). The most important markets for Polish exports were Germany (USD 555.2 million), Czechia (USD 51.8 million), Sweden (USD 20.8 million), Slovakia (USD 18.3 million), and Finland (USD 15.8 million). Poland mainly imported vaccines from Belgium (USD 586.6 million), Italy (USD 104.7 million), Germany

(USD 39.8 million), France (USD 30.5 million), and Hungary (USD 12.9 million). The table provides both value and quantity, as there are some significant differences between both lists. For example, Poland's export to Lavia (USD 7.8 million) and Russia (USD 7.6 million) have a relatively similar value, but widely different quantity: 10 309 kg for the former and 360 kg for the latter.

Table 5.6. Poland's foreign trade in vaccines for human medicine by partner in 2020

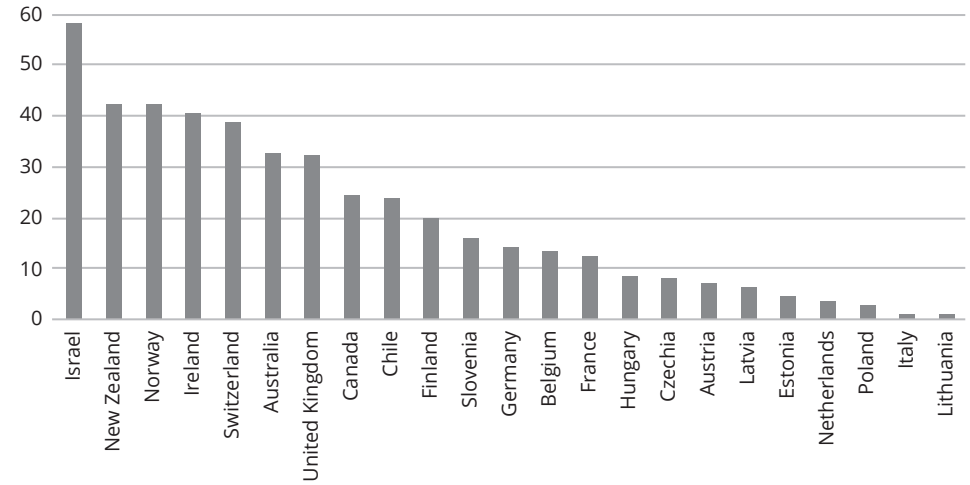
Partner	Poland's export		Partner	Poland's import	
	Value (USD thousands)	Quantity (kg)		Value (USD thousands)	Quantity (kg)
Germany	555 215	211 859	Belgium	586 587	166 351
Czechia	51 776	31 886	Italy	104 714	47 573
Sweden	20 830	26 152	Germany	39 803	46 599
Slovakia	18 327	15 203	France	30 480	55 873
Finland	15 790	5523	Hungary	12 890	36 222
Lithuania	11 452	11 110	United Kingdom	8780	6152
Netherlands	10 686	8956	India	6521	9809
Latvia	7835	10 309	Austria	5261	7772
Russia	7597	360	Ireland	4794	1649
Estonia	3726	6619	Netherlands	4062	730
World	**705 948**	**330 430**	**World**	**811 235**	**396 949**

Source: World Bank [2023].

5.6. International migration of healthcare professionals

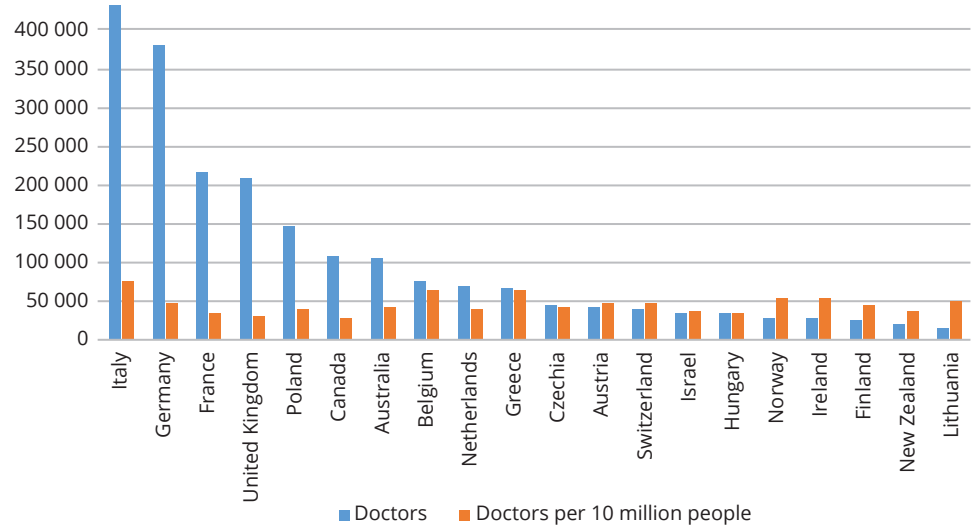
Figure 5.4 explores the percentage of foreign-trained doctors in selected economies (the ratio of foreign-trained doctors to total doctors). OECD defines foreign-trained doctors as "doctors who have obtained their first medical qualification (degree) in another country and are entitled to practice in the receiving country" [OECD, 2023b]. Of the listed economies, the percentage was the highest in Israel (57.8%), New Zealand (42.1%), Norway (41.1%), Ireland (40.5%), and Switzerland (38.4%). 2.7% of doctors in Poland were foreign-trained, which is less than in Czechia (7.6%), but more than in Italy (0.9%).

Figure 5.4. Percentage of foreign-trained doctors in selected economies in 2021 (%)



Source: OECD [2023c].

Figure 5.5. Number of doctors in selected economies in stock in 2021



Source: IMF [2023] and OECD [2023c].

Figure 5.5 visualises the total number of doctors in selected economies (both domestic- and foreign-trained). Italy (429.6 thousand) leads in this category, followed closely by Germany (378.6 thousand), with other significant values including France (215.7 thousand), the United Kingdom (207.6 thousand), Poland (146.1 thousand),

Canada (107.3 thousand), and Australia (103.2 thousand). Poland had significantly more doctors than Canada, despite the latter having a larger population and a higher level of economic development. The number of doctors per 10 million people was the highest in Italy (72.8 thousand), followed by Belgium (62.9 thousand) and Greece (62.3 thousand). Poland (38.6 thousand) had more doctors per 10 million people than France (33.0 thousand), the United Kingdom (30.9 thousand), and Canada (28.1 thousand).

Table 5.7 investigates the number of foreign-trained doctors in Poland, Germany, the United Kingdom, and Norway by their country of origin. Foreign-trained doctors in Poland originated primarily from Ukraine (1746), Belarus (662), Russia (192), Slovakia (156), and Germany (62). For Germany, the most common country of origin was Syria (4649), for the United Kingdom it was India (18 953), and for Norway – Poland (2738). In total, Poland's 3937 foreign-trained doctors is a number far lower than that in the United Kingdom (66 211), Germany (52 194), and Norway (11 697).

Table 5.7. Number of foreign-trained doctors in selected economies in stock in 2021

Poland		Germany		United Kingdom		Norway	
Country of origin	Number	Country of origin	Number	Country of origin	Number	Country of origin	Number
Ukraine	1746	Syria	4649	India	18 953	Poland	2738
Belarus	662	Romania	3914	Pakistan	8026	Germany	1530
Russia	192	Greece	2372	Nigeria	4880	Hungary	1413
Slovakia	156	Russia	2262	Egypt	4471	Denmark	1215
Germany	62	Austria	2145	Ireland	1860	Slovakia	593
Lithuania	60	Serbia	1776	Sudan	1714	Sweden	566
Czechia	56	Poland	1702	Romania	1388	Czechia	389
Bulgaria	54	Ukraine	1686	Greece	1381	Russia	274
Kazakhstan	38	Bulgaria	1624	Iraq	1377	Ireland	248
Romania	29	Egypt	1520	Sri Lanka	1353	Netherlands	192
Total	**3937**	**Total**	**52 194**	**Total**	**66 211**	**Total**	**11 697**

Source: OECD [2023c].

The emigration of healthcare professionals has been a hot topic of discussion in Poland for several years. Table 5.8 shows the total number (stock) of foreign-trained doctors per country where Poland was the country of origin. The list includes the top 18 destinations according to the 2021 data, as well as Sweden and the United States (missing data for 2021, but historically significant). In 2021, the top destinations for Polish-trained doctors were Norway (2738), Germany (1702), the United Kingdom

(1097), Canada (570), and Ireland (310). Most likely, the United States would still be the primary destination, but we do not have the data confirming this fact after 2016. The list is dominated by advanced Western economies.

Table 5.8. Top destinations of Polish-trained doctors in stock in 2021

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Norway	1083	1258	1412	1590	1772	1966	2125	2322	2519	2738
Germany	1451	1527	1598	1669	1697	1756	1781	1781	1776	1702
United Kingdom	718	783	825	774	832	875	914	995	1029	1097
Canada	539	560	572	577	566	562	574	587	572	570
Ireland	184	229	238	258	263	288	282	294	297	310
France	281	288	291	288	288	284	282	285	279	270
Switzerland	139	153	157	162	169	181	188	186	191	204
Israel	232	219	211	205	200	202	203	192	192	192
Belgium	53	60	66	70	76	82	88	97	102	109
Finland	56	54	55	56	57	61	63	66	71	76
Netherlands	31	34	35	37	38	59	69	71	70	75
Italy	–	–	–	–	–	–	–	46	52	54
Greece	35	35	34	33	31	34	45	44	45	47
Czechia	15	6	7	21	26	30	37	37	41	42
New Zealand	28	30	29	29	28	29	36	40	36	37
Austria	23	23	27	31	20	19	20	22	22	24
Hungary	8	8	9	5	6	7	8	8	6	6
Slovenia	5	5	5	4	5	5	5	5	5	5
Sweden	1190	1312	1445	663	772	885	1038	1146	1292	–
United States	2645	2724	2735	2788	2833	–	–	–	–	–

Source: OECD [2023c].

5.7. Conclusions

Since 2004 and its accession to the European Union, Poland has run a persistent trade in goods deficit and a current account balance deficit, with a brief surplus in 2020. On the other hand, Poland's balance on services has been consistently and significantly positive. In 2022, Poland had a current account deficit (−3.2% of GDP), trade in goods deficit (USD −25.5 billion), and trade in services surplus (USD 38.3 billion).

In general, Poland mostly exports to local economies. In 2022, it had a large surplus in trade with its most important trade partner – Germany (USD 20.2 billion) – and

deficits with China (USD −44.1 billion), Russia (USD −11.8 billion), and the United States (USD −5.8 billion). In 2022, the value of Poland's exports to Russia decreased by 45.2%, and its imports from Russia decreased by 17.2%. In 2020, Poland's exported product categories with the highest RCA were food (2.33), wood (2.32), and animal (1.98). The lowest RCA was observed for the minerals (0.14), fuels (0.16), and raw materials (0.54) product categories, echoing the decline of Poland's mining sector.

According to the 2022 value, pharmaceutical products were Poland's 18th most important exported product (USD 4.8 billion, 1.3% of total export) and 8th most important imported product (USD 8.4 billion, 2.4% of total export). Poland's trade deficit in pharmaceutical products stood at USD −3.8 billion, which is better than in 2021 (USD −4.9 billion). Globally, Poland was the 22nd largest exporter and the 20th largest importer, mostly exporting to Germany (USD 794.1 million), Russia (USD 368.7 million), and France (USD 241.5 million), and importing from Germany (USD 1.6 billion), the United States (USD 1.2 billion), and Ireland (USD 534 million). In 2020, the top market for Polish exports of vaccines for human medicine was Germany (USD 555.2 million), while Poland predominantly imported them from Belgium (USD 586.6 million).

In 2021, Poland had 146.1 thousand doctors, compared to 378.6 thousand in Germany, 215.7 thousand in France, and 207.6 thousand in the United Kingdom. Poland had more doctors per capita than the highly developed economies of France, the United Kingdom, and Canada. In the big picture, the emigration of Polish-trained doctors remains relatively small. According to the data, the stock of Polish-trained doctors in the two most popular destinations (Norway and Germany) was around 1.9% and 1.2% of the total number of doctors in Poland, respectively.

Among the analysed economies, the percentage of foreign-trained doctors was the highest in Israel (57.8%), New Zealand (42.1%), and Norway (41.1%), while the percentage was the lowest in Lithuania (0.7%), Italy (0.9%), and Poland (2.7%). In general, the number of foreign-trained doctors in Poland (3937) was lower than that in the United Kingdom (66 211), Germany (52 194), and Norway (11 697). Foreign-trained doctors in Poland originated primarily from Ukraine (1746), Belarus (662), and Russia (192).

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Chapter 6

Total Factor Productivity

Mariusz Próchniak

6.1. Introduction

Total factor productivity will be analysed using growth accounting. Growth accounting is the empirical study of how much economic growth is due to changes in the inputs of measurable factors of production and how much is due to changes in the level of technology, as measured by the growth rate of total factor productivity (TFP).

The analysis covers 11 Central and Eastern European countries – the EU-11 group (Poland, Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Romania, Slovakia and Slovenia) and the period 2013–2022. In order to assess the rate of change in total factor productivity over the years surveyed, we also present average TFP growth rates for the following three sub-periods: 2013–2015, 2016–2019 and 2020–2021, while 2022 is analysed separately.

This study is a continuation of previous research in this area, presented in previous editions of the report [see, e.g., Próchniak 2019, 2022, 2023]. The 2020 edition of the study [Próchniak, 2020] also included sector-level growth accounting.

6.2. Changes in total factor productivity – theoretical foundations

The origins of growth accounting date back to the first half of the twentieth century. The concept of total productivity and the view that labour is not the only factor of production and that other factors such as capital and land should be taken into account when measuring the wealth of nations and productivity were discussed in the economic literature in the 1930s [Griliches, 1996]. The first references to an input-output type indicator appeared in Copeland's 1937 work [Griliches, 1996]. In the 1940s and 1950s, a number of largely independent studies were published with the results of empirical studies on the measurement of TFP. The first such study, carried out by the Dutch economist Jan Tinbergen, was published in 1942. In the following

years, further works were written examining the relationship between the volume of production and the inputs incurred [see, e.g., Tintner, 1944; Barton, Cooper, 1948; Johnson, 1950; Schmookler, 1952; Abramovitz, 1956; Kendrick, 1956; Ruttan, 1956].

The first economist to formalise growth accounting was Robert Solow [1957]. Using the macroeconomic production function and differential calculus, he showed how the rate of economic growth can be broken down into the part resulting from increased inputs of factors of production and the remaining part, the so-called 'Solow residual'. The latter shows what proportion of economic growth cannot be attributed to individual factors. It is therefore a measure of technological progress, i.e., TFP growth.

In the following years, further works on growth accounting were published, introducing new approaches and expanding earlier studies and incorporating new elements of empirical analysis [see, e.g., Solow, 1962; Griliches, 1964; Jorgenson, Griliches, 1967].

The breakdown of economic growth pioneered by Solow forms the basis of modern growth accounting. The starting point for such an analysis is the macroeconomic production function. Its general form is as follows:

$$Y(t) = F\left(A(t), Z_1(t), \ldots, Z_n(t)\right), \tag{6.1}$$

where Y – production (GDP), A – level of technology, Z_1, …, Z_n – measurable factors of production. Empirical studies usually include two or three measurable factors of production, namely labour, tangible (physical) capital and possibly human capital.

The analysis in this edition of the report will focus on two measurable factors of production: labour and tangible capital.[1] The production function (6.1), therefore, takes the following form:

$$Y(t) = F\left(A(t), L(t), K(t)\right). \tag{6.2}$$

In order to breakdown the economic growth rate into its individual components, equation (6.2) needs to be transformed to represent the growth rate Y. This is achieved by time differentiation of (6.2) and then dividing it by Y. The result is:

$$\frac{\dot{Y}}{Y} = \frac{\frac{\partial F\left(A,L,K\right)}{\partial A}\dot{A}}{Y} + \frac{\frac{\partial F\left(A,L,K\right)}{\partial L}\dot{L}}{Y} + \frac{\frac{\partial F\left(A,L,K\right)}{\partial K}\dot{K}}{Y}. \tag{6.3}$$

[1] In the 2012 and 2014 editions of the study, in addition to the basic growth accounting model, an extended model including human capital was also estimated [Próchniak, 2012, 2014].

After multiplying the individual components on the right-hand side of equation (6.3) by A/A, L/L and K/K respectively, we obtain:

$$\frac{\dot{Y}}{Y}=\frac{\frac{\partial F\left(A,L,K\right)}{\partial A}A}{Y}\frac{\dot{A}}{A}+\frac{\frac{\partial F\left(A,L,K\right)}{\partial L}L}{Y}\frac{\dot{L}}{L}+\frac{\frac{\partial F\left(A,L,K\right)}{\partial K}K}{Y}\frac{\dot{K}}{K}. \tag{6.4}$$

Equation (6.4) shows that the GDP growth rate is a weighted average of the growth rates of three factors: technology, labour and tangible capital. The weights are the shares of each factor in GDP, measured as the marginal product of the factor (at the level of the whole economy) multiplied by the quantity of the factor and divided by the volume of production.

6.3. Methodology

The research methodology used in this chapter is economic growth accounting. In order to be able to calculate the growth rate of TFP in an empirical study, additional premises need to be introduced into the equation (6.4), which represents the essence of economic growth accounting.

We assume, firstly, that the production function is characterised by Hicks-neutral technological progress. Thus, the function can be written as follows:

$$F(A,L,K)=A\cdot f(L,K). \tag{6.5}$$

As can be seen, Hicks-neutral technological progress means that the variable A, representing the level of technology, is in the product of the production function f, which makes the volume of production dependent on the inputs of measurable factors. Technological progress has an equal contribution to both factors of production, without changing the marginal rate of technical substitution between them. For the production function (6.5), the technology income share, i.e., the component $(\partial F/\partial A)$ A/Y in equation (6.4), is 1. Equation (6.4) can then be written as:

$$\frac{\dot{Y}}{Y}=\frac{\dot{A}}{A}+\frac{\frac{\partial F\left(A,L,K\right)}{\partial L}L}{Y}\frac{\dot{L}}{L}+\frac{\frac{\partial F\left(A,L,K\right)}{\partial K}K}{Y}\frac{\dot{K}}{K}. \tag{6.6}$$

The above equation shows that the rate of economic growth is the sum of technological progress (TFP growth) and the average growth rate of the stock of labour and tangible capital, weighted by the income shares of both factors.

An additional assumption must also be made regarding the marginal products of the two factors. The marginal product of labour and capital at the level of the whole economy is in fact unmeasurable. We therefore assume that all markets are perfectly competitive and that there are no externalities. In this case, the marginal product of capital $\partial F/\partial K$ is equal to the price of capital r, while the marginal product of labour $\partial F/\partial L$ is equal to the wage rate w. When the capital income share (rK/Y) is denoted by s_K and by s_L the labour income share (wL/Y), equation (6.6) can be written as:

$$\frac{\dot{Y}}{Y}=\frac{\dot{A}}{A}+s_K\frac{\dot{K}}{K}+s_L\frac{\dot{L}}{L}. \tag{6.7}$$

If it is also assumed that all income can be attributed to one of two factors of production: labour or tangible capital, i.e., $Y = wL + rK$, the labour income share and the tangible capital income share add up to unity: $s_K + s_L = 1$. Thus, formula (6.7) takes the following form:

$$\frac{\dot{Y}}{Y}=\frac{\dot{A}}{A}+s_K\frac{\dot{K}}{K}+\left(1-s_K\right)\frac{\dot{L}}{L}. \tag{6.8}$$

Equation (6.8) is the basis of standard growth accounting. This equation can be used to calculate the TFP growth rate as the difference between the GDP growth rate and the weighted average growth rate of the two factors of production:

$$TFP\ growth=\frac{\dot{A}}{A}=\frac{\dot{Y}}{Y}-\left[s_K\frac{\dot{K}}{K}+\left(1-s_K\right)\frac{\dot{L}}{L}\right]. \tag{6.9}$$

6.4. Results of the empirical study

For the purpose of the analysis, we collected data forming the following time series:

a) economic growth rate,
b) labour input change rate,
c) tangible capital input change rate.

Economic growth rate is the annual growth rate of total real GDP from the IMF database [IMF, 2023]. The labour input change rate is measured by the rate of increase in employment reported by the International Labour Organisation [ILO, 2023]. We calculated the time series of the tangible capital stock based on the perpetual inventory method using World Bank data [World Bank, 2023]. This method requires several assumptions to be made. We have assumed that the depreciation rate is 5% and the initial capital/production ratio is three. In the perpetual inventory method, the starting

year should be slightly earlier than the years for which TFP is calculated; in our study, we start the calculations in 2000 and that is the year for which the capital/production ratio is assumed to be three. As investment, we use a variable measuring gross fixed capital formation. The shares of labour and tangible capital in income are one second.

In this edition of the study, we have updated all the time series of the variables analysed. All calculations were made anew. Therefore, the documentation of the results is fully presented in the text of the study and does not duplicate the information contained in earlier editions of the report.

Table 6.1 shows the detailed results of the economic growth rate breakdown, while Tables 6.2 and 6.3 summarise the data from Table 6.1.

Romania, Poland, Slovenia and Croatia recorded the highest TFP growth rates throughout the period (at least 1.5% per year). In Romania, TFP grew by an average of 2.3% per year, in Poland and Slovenia by 1.9%, and in Croatia by 1.5%. Poland's results should be regarded as a major success (compared to other new EU members). If we use TFP changes as an approximate measure of technological progress, Poland was at the forefront of EU-11 countries in terms of creating new technologies. In other EU-11 countries, the rate of increase in productivity did not exceed 1.2% on average per year. Over the entire ten-year period, Latvia, Lithuania, Hungary and Bulgaria saw average TFP growth of 1–1.2%, while Czechia, Estonia and Slovakia saw marginal average TFP growth (0.4–0.6%) between 2013 and 2022.

In general, looking at the EU-11 group as a whole, the rate of growth of TFP was modest over the period 2013–2022. The poor results are due to a large decline in total factor productivity in the countries surveyed in 2020, i.e., during the coronavirus pandemic. The recession noted in all countries in 2020 led to negative TFP growth rates in 2020.

We assume in this chapter that TFP growth is an approximate measure of technological progress. However, if it is calculated using the residual TFP method based on growth accounting, it has its drawbacks as an indicator of technological progress, and this should be borne in mind when interpreting the results. Firstly, the 2020 economic recession, which is the result of external factors and is not reflected that strongly in the accumulation of labour and especially capital, which is the result of investment made in earlier years, results in a negative estimate of the rate of growth of TFP in 2020. Secondly, the part of TFP that is the result of increased labour productivity should be partly treated as a contribution of human capital to economic growth. Given the difficulties in calculating the stock of this type of capital for the group of countries analysed, in our approach TFP also includes the impact of human capital on growth.

The inclusion of human capital in TFP has very important implications from the point of view of the main topic of the *Report*. Namely, human capital accumulation

depends primarily on the following factors – knowledge and skills, derived from education, and the health of the labour force. The healthier the society, the greater the human capital stock, as workers are more productive and the employment rate is higher. As a result, the TFP growth rate is accelerating, which translates into faster economic growth.

From one year to the next, the leading countries in terms of the rate of change in total factor productivity change. This is because economic growth accounting is a study with results that are strongly influenced by fluctuations in individual variables (labour input, capital input and production volume). These variables (and in particular the volume of production) fluctuate strongly from year to year as a result of economic cycles and irregular fluctuations due to various demand and supply shocks, both internal and external ones. Therefore, the ranking of countries in terms of the rate of growth of TFP fluctuates considerably widely from one year to the next. In analyses prepared many years ago, the Baltic countries led the way in terms of the rate of growth of TFP. Prior to the 2008–2009 global crisis, they were exhibiting rapid economic growth, which was difficult to explain by changes in labour and tangible capital, and was therefore attributed to the TFP. Poland's position in the above-mentioned analyses was moderate – not as strong as that of the Baltic countries, but not at the tail end of the group either. The extension and shifting of the time horizon significantly changed the ratings of individual countries in Poland's favour.

Table 6.1. Contribution of labour, tangible capital and TFP to economic growth in 2013–2022

		2013			2014			2015			2016			2017			2018			2019			2020			2021			2022		
		Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)
Bulgaria	L	0.0	0.0	−3	1.6	0.8	82	1.7	0.8	25	−0.5	−0.2	−8	4.4	2.2	80	0.1	0.0	1	2.6	1.3	32	−3.4	−1.7	43	−1.4	−0.7	−9	2.4	1.2	36
	C	2.2	1.1	−197	2.1	1.0	108	2.2	1.1	32	2.2	1.1	36	1.6	0.8	29	1.7	0.8	32	1.9	1.0	24	2.1	1.1	−27	2.0	1.0	13	1.3	0.7	19
	TFP	−1.7	−1.7	300	−0.9	−0.9	−90	1.5	1.5	43	2.2	2.2	72	−0.2	−0.2	−9	1.8	1.8	67	1.8	1.8	44	−3.3	−3.3	83	7.4	7.4	96	1.5	1.5	45
	GDP	−0.6	−0.6	100	1.0	1.0	100	3.4	3.4	100	3.0	3.0	100	2.8	2.8	100	2.7	2.7	100	4.0	4.0	100	−4.0	−4.0	100	7.6	7.6	100	3.4	3.4	100
Croatia	L	−2.7	−1.3	338	2.7	1.4	−317	1.3	0.6	25	0.3	0.1	4	2.2	1.1	32	1.8	0.9	33	1.5	0.7	22	−1.3	−0.7	8	1.3	0.6	5	1.7	0.9	14
	C	0.7	0.3	−87	0.7	0.4	−82	0.5	0.3	11	1.0	0.5	14	1.2	0.6	18	1.2	0.6	22	1.4	0.7	20	1.9	0.9	−11	1.4	0.7	5	1.6	0.8	13
	TFP	0.6	0.6	−151	−2.2	−2.2	499	1.6	1.6	64	2.9	2.9	82	1.7	1.7	50	1.3	1.3	45	2.0	2.0	58	−8.8	−8.8	103	11.8	11.8	90	4.5	4.5	73
	GDP	−0.4	−0.4	100	−0.4	−0.4	100	2.5	2.5	100	3.6	3.6	100	3.4	3.4	100	2.8	2.8	100	3.4	3.4	100	−8.5	−8.5	100	13.1	13.1	100	6.2	6.2	100
Czechia	L	1.0	0.5	−1045	0.8	0.4	17	1.4	0.7	13	1.9	1.0	38	1.6	0.8	16	1.4	0.7	21	0.2	0.1	3	−1.3	−0.6	12	−0.3	−0.2	−4	−0.9	−0.4	−19
	C	2.5	1.2	−2711	2.2	1.1	48	2.2	1.1	21	2.8	1.4	54	2.3	1.2	22	2.5	1.3	39	3.1	1.5	50	3.3	1.6	−30	2.5	1.3	36	2.4	1.2	52
	TFP	−1.8	−1.8	3856	0.8	0.8	36	3.6	3.6	67	0.2	0.2	8	3.2	3.2	62	1.3	1.3	40	1.4	1.4	47	−6.5	−6.5	118	2.4	2.4	69	1.6	1.6	67
	GDP	−0.0	−0.0	100	2.3	2.3	100	5.4	5.4	100	2.5	2.5	100	5.2	5.2	100	3.2	3.2	100	3.0	3.0	100	−5.5	−5.5	100	3.6	3.6	100	2.3	2.3	100
Estonia	L	1.0	0.5	36	0.6	0.3	9	2.6	1.3	69	0.6	0.3	9	2.2	1.1	19	0.9	0.5	12	1.0	0.5	12	−2.2	−1.1	114	−0.4	−0.2	−2	4.1	2.0	−441
	C	3.7	1.9	128	3.5	1.8	59	3.0	1.5	82	2.5	1.3	40	2.7	1.4	24	3.6	1.8	47	4.1	2.1	51	3.5	1.7	−179	5.2	2.6	36	5.0	2.5	−538
	TFP	−0.9	−0.9	−64	1.0	1.0	32	−0.9	−0.9	−51	1.6	1.6	50	3.3	3.3	58	1.5	1.5	40	1.5	1.5	36	−1.6	−1.6	166	4.8	4.8	67	−5.0	−5.0	1079
	GDP	1.5	1.5	100	3.0	3.0	100	1.9	1.9	100	3.2	3.2	100	5.8	5.8	100	3.8	3.8	100	4.0	4.0	100	−1.0	−1.0	100	7.2	7.2	100	−0.5	−0.5	100
Hungary	L	1.7	0.9	47	5.3	2.7	63	2.7	1.3	36	3.4	1.7	76	1.6	0.8	19	1.1	0.5	10	1.0	0.5	10	−1.1	−0.6	13	4.1	2.0	28	1.4	0.7	16
	C	0.8	0.4	23	1.3	0.7	16	2.0	1.0	27	2.2	1.1	50	1.3	0.7	15	2.5	1.2	23	3.5	1.7	36	4.2	2.1	−47	3.2	1.6	22	3.5	1.7	38
	TFP	0.5	0.5	30	0.9	0.9	21	1.4	1.4	37	−0.6	−0.6	−26	2.8	2.8	66	3.6	3.6	67	2.7	2.7	55	−6.1	−6.1	134	3.6	3.6	49	2.1	2.1	46
	GDP	1.8	1.8	100	4.2	4.2	100	3.7	3.7	100	2.2	2.2	100	4.3	4.3	100	5.4	5.4	100	4.9	4.9	100	−4.5	−4.5	100	7.2	7.2	100	4.6	4.6	100
Latvia	L	2.1	1.0	52	−1.0	−0.5	−27	1.3	0.6	17	−0.3	−0.2	−7	0.2	0.1	3	1.6	0.8	20	0.1	0.0	1	−1.9	−0.9	41	−2.6	−1.3	−31	2.5	1.2	45
	C	3.2	1.6	81	2.6	1.3	69	2.1	1.1	28	1.9	0.9	39	1.2	0.6	18	1.8	0.9	22	2.5	1.2	48	2.8	1.4	−61	2.4	1.2	28	2.4	1.2	44
	TFP	−0.7	−0.7	−32	1.1	1.1	58	2.2	2.2	56	1.6	1.6	68	2.6	2.6	80	2.3	2.3	57	1.3	1.3	51	−2.8	−2.8	120	4.4	4.4	103	0.3	0.3	11
	GDP	2.0	2.0	100	1.9	1.9	100	3.9	3.9	100	2.4	2.4	100	3.3	3.3	100	4.0	4.0	100	2.6	2.6	100	−2.3	−2.3	100	4.3	4.3	100	2.8	2.8	100

cont. table 6.1

		2013			2014			2015			2016			2017			2018			2019			2020			2021			2022		
		Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)	Growth (%)	Contribution (p.p.)	Contribution (%)
Lithuania	L	1.3	0.7	19	2.0	1.0	29	1.2	0.6	30	2.0	1.0	39	−0.5	−0.2	−6	1.5	0.7	18	0.3	0.1	3	−1.5	−0.7	3343	0.8	0.4	6	3.8	1.9	101
	C	2.1	1.0	30	2.5	1.3	36	2.8	1.4	68	2.9	1.5	58	3.0	1.5	35	3.4	1.7	43	4.0	2.0	43	4.2	2.1	−9509	3.8	1.9	32	4.1	2.1	110
	TFP	1.8	1.8	52	1.3	1.3	36	0.0	0.0	2	0.1	0.1	3	3.0	3.0	71	1.6	1.6	39	2.5	2.5	54	−1.4	−1.4	6266	3.7	3.7	62	−2.1	−2.1	−111
	GDP	3.6	3.6	100	3.5	3.5	100	2.0	2.0	100	2.5	2.5	100	4.3	4.3	100	4.0	4.0	100	4.6	4.6	100	−0.0	−0.0	100	6.0	6.0	100	1.9	1.9	100
Poland	L	−0.1	−0.1	−8	1.9	0.9	25	1.4	0.7	16	0.7	0.4	12	1.4	0.7	14	0.4	0.2	3	−0.1	−0.1	−2	−0.1	−0.1	3	1.3	0.7	9	0.5	0.3	5
	C	2.8	1.4	161	2.6	1.3	33	3.2	1.6	37	3.5	1.8	60	2.6	1.3	25	2.5	1.3	21	3.3	1.6	37	3.5	1.8	−87	3.0	1.5	22	3.0	1.5	29
	TFP	−0.4	−0.4	−52	1.6	1.6	42	2.1	2.1	47	0.8	0.8	28	3.1	3.1	61	4.5	4.5	75	2.9	2.9	65	−3.7	−3.7	184	4.8	4.8	69	3.4	3.4	66
	GDP	0.9	0.9	100	3.8	3.8	100	4.4	4.4	100	3.0	3.0	100	5.1	5.1	100	5.9	5.9	100	4.5	4.5	100	−2.0	−2.0	100	6.9	6.9	100	5.1	5.1	100
Romania	L	−0.6	−0.3	−130	0.8	0.4	9	−0.9	−0.5	−14	−1.0	−0.5	−18	2.6	1.3	16	0.2	0.1	2	−0.1	−0.0	−1	−1.8	−0.9	25	−9.0	−4.5	−76	0.7	0.3	7
	C	3.8	1.9	760	3.0	1.5	36	3.2	1.6	50	3.6	1.8	62	3.1	1.5	19	3.3	1.6	27	3.0	1.5	39	3.8	1.9	−51	3.5	1.8	30	3.4	1.7	36
	TFP	−1.3	−1.3	−530	2.2	2.2	54	2.0	2.0	64	1.6	1.6	56	5.4	5.4	65	4.3	4.3	71	2.4	2.4	62	−4.7	−4.7	126	8.6	8.6	146	2.7	2.7	57
	GDP	0.2	0.2	100	4.1	4.1	100	3.2	3.2	100	2.9	2.9	100	8.2	8.2	100	6.0	6.0	100	3.8	3.8	100	−3.7	−3.7	100	5.9	5.9	100	4.7	4.7	100
Slovakia	L	0.0	0.0	2	4.1	2.0	75	0.0	0.0	0	2.8	1.4	72	1.5	0.8	26	1.4	0.7	18	0.6	0.3	12	−2.1	−1.0	31	1.0	0.5	10	1.9	1.0	57
	C	2.6	1.3	205	2.5	1.2	46	2.5	1.3	24	3.9	2.0	101	2.8	1.4	47	2.8	1.4	35	2.8	1.4	56	3.1	1.5	−46	2.0	1.0	21	2.1	1.0	63
	TFP	−0.7	−0.7	−106	−0.6	−0.6	−21	3.9	3.9	75	−1.4	−1.4	−73	0.8	0.8	26	1.9	1.9	47	0.8	0.8	32	−3.8	−3.8	115	3.4	3.4	69	−0.3	−0.3	−20
	GDP	0.6	0.6	100	2.7	2.7	100	5.2	5.2	100	1.9	1.9	100	2.9	2.9	100	4.0	4.0	100	2.5	2.5	100	−3.3	−3.3	100	4.9	4.9	100	1.7	1.7	100
Slovenia	L	−1.9	−1.0	94	1.2	0.6	22	0.1	0.0	2	−0.3	−0.1	−4	4.8	2.4	50	2.2	1.1	25	0.2	0.1	3	−0.5	−0.2	5	−0.7	−0.3	−4	1.5	0.7	30
	C	0.4	0.2	−20	0.6	0.3	10	0.5	0.3	12	0.4	0.2	7	0.2	0.1	2	0.7	0.4	8	1.3	0.6	18	1.5	0.8	−18	0.9	0.5	6	1.7	0.8	34
	TFP	−0.3	−0.3	26	1.9	1.9	68	1.9	1.9	86	3.1	3.1	97	2.3	2.3	48	3.0	3.0	66	2.8	2.8	79	−4.8	−4.8	112	8.1	8.1	99	0.9	0.9	36
	GDP	−1.0	−1.0	100	2.8	2.8	100	2.2	2.2	100	3.2	3.2	100	4.8	4.8	100	4.5	4.5	100	3.5	3.5	100	−4.2	−4.2	100	8.2	8.2	100	2.5	2.5	100

Source: own elaboration.

Table 6.2. TFP growth rates (%)

Country	The entire 2013–2022 period			2013–2015	2016–2019	2020–2021	2022
	average	minimum	maximum	average	average	average	
Bulgaria	1.0	−3.3	7.4	−0.4	1.4	2.0	1.5
Croatia	1.5	−8.8	11.8	0.0	2.0	1.5	4.5
Czechia	0.6	−6.5	3.6	0.9	1.5	−2.0	1.6
Estonia	0.5	−5.0	4.8	−0.3	2.0	1.6	−5.0
Lithuania	1.1	−2.1	3.7	1.0	1.8	1.2	−2.1
Latvia	1.2	−2.8	4.4	0.9	2.0	0.8	0.3
Poland	**1.9**	**−3.7**	**4.8**	**1.1**	**2.8**	**0.5**	**3.4**
Romania	2.3	−4.7	8.6	1.0	3.4	2.0	2.7
Slovakia	0.4	−3.8	3.9	0.9	0.5	−0.2	−0.3
Slovenia	1.9	−4.8	8.1	1.2	2.8	1.7	0.9
Hungary	1.1	−6.1	3.6	0.9	2.1	−1.3	2.1

Source: own elaboration.

Table 6.3. TFP contribution to economic growth (%)

Country	The entire 2013–2022 period		
	average	minimum	maximum
Bulgaria	65	−90	300
Croatia	91	−151	499
Czechia	437	8	3856
Estonia	141	−64	1079
Lithuania	647	−111	6266
Latvia	57	−32	120
Poland	**59**	**−52**	**184**
Romania	17	−530	146
Slovakia	15	−106	115
Slovenia	72	26	112
Hungary	48	−26	134

Source: own elaboration.

Croatia, Romania and Slovenia had the largest fluctuations in TFP growth rates in the years studied. The variation in the rate of productivity change in these countries was primarily due to the sharp decline in TFP in 2020 as a result of the deep recession resulting from the coronavirus pandemic. In Croatia, for example, real GDP in 2020 fell by 8.5%, making it the EU-11 country with the deepest recession in 2020. In these

three countries, the difference between the highest and lowest reported TFP growth rates in 2013–2022 was more than 12 p.p. (in Croatia – exceeding 20 p.p.). In other CEE countries, the spread of TFP growth rates was also high, ranging from 5.8 p.p. in Lithuania to almost 11 p.p. in Bulgaria. The large spread in TFP fluctuations is due to the large declines in productivity observed in 2020 in all countries as a result of the coronavirus pandemic. In Poland, the lowest TFP growth rate during the period examined occurred in 2020 (–3.7%), while the highest was in 2021 (4.8%).

The data for the different sub-periods show different countries' behaviour in terms of the rate of growth of TFP. In general, TFP growth rates were not particularly high in the demarcated sub-periods.

In 2013–2015, two countries in the studied group (Bulgaria and Estonia) recorded negative TFP growth. Obviously, it is difficult to view the decline in TFP as a technological regression – this result is a consequence of the residual method of calculating TFP. Nevertheless, negative values do not mean success in terms of productivity changes. One country (Croatia) showed no change in TFP. During this period, Slovenia and Poland were the leaders in terms of total factor productivity growth rate, with TFP growing at an average annual rate of more than 1%.

In the next sub-period 2016–2019, no country recorded a negative TFP growth rate. Excluding Slovakia, productivity growth was faster in 2016–2019 than in 2013–2015. In 2016–2019, Romania (3.4%) and Poland and Slovenia (2.8%) were the leaders in terms of the rate of growth of TFP. Poland's high position deserves special attention, and is due to the good economic situation and the good macroeconomic performance of the Polish economy in the second half of the second decade of the twenty-first century.

There was a sharp deterioration in terms of changes of total factor productivity in the 2020–2021 period compared to 2016–2019. Three EU-11 countries recorded negative TFP growth: Czechia (−2.0%), Hungary (−1.3%) and Slovakia (−0.2%). The leaders in terms of TFP changes over this period were Romania and Bulgaria (2.0%). The poor performance in terms of TFP growth rate was due to the recession observed in EU-11 countries in 2020 as a result of the COVID-19 pandemic. The EU-11 countries also recorded a decline in employment in 2020. By contrast, the stock of tangible capital in these countries increased. The increase in the capital stock is due to capital expenditure resulting from investment undertaken in earlier years, when no one expected a global pandemic outbreak. In the perpetual inventory method we use, investment data from 2019 (and from earlier years) is used to estimate the amount of capital in 2020. Therefore – with a good business climate in 2019 – investment was strong and the capital stock in all countries in the study group increased in 2020 (in most countries – at a faster rate than in 2019).

In 2022, the performance of the EU-11 countries was highly variable. Some countries saw a rapid increase in TFP, while other countries suffered a steep decline. The leaders in terms of changes in total factor productivity were Croatia, with a 4.5% increase in TFP in 2022, and Poland (3.4%). Romania and Hungary also recorded solid results, at 2.7% and 2.1%, respectively. In Czechia, Bulgaria, Slovenia and Latvia, productivity grew at a rate of below 2%. In contrast, Slovakia, Lithuania and Estonia recorded decreases in TFP of 0.3%, 2.1% and 5.0%, respectively. The variation in productivity ratings in 2022 is due to issues including the variation in macroeconomic performance. For example, in 2022, some EU-11 countries achieved rapid economic growth (including Croatia – 6.2%, Poland – 5.1%), some saw marginal growth in production (Lithuania – 1.9%, Slovakia – 1.7%), and others (Estonia) experienced a recession.

As regards TFP's contribution to economic growth, the figures for the period under study are partly distorted, which is due for instance to the fact that positive rate of growth of TFP during the period of recession implies a negative TFP contribution to economic growth (Croatia in 2013 is an example). In contrast, when the rate of GDP change is close to 0%, a several percent change in total factor productivity translates into several thousand percent TFP contributions to economic growth (e.g., Czechia in 2013). The statistics of the TFP's contribution to economic growth were also distorted by the coronavirus pandemic. Nevertheless, some trends and regularities can be determined from the aggregated results for the entire period.

As can be seen from the data presented in Table 6.3, the percentage contributions of TFP to economic growth were in the range of 48–91% in many countries (excluding Lithuania, Czechia, Estonia, Romania and Slovakia) over the period 2013–2022. This confirms the important role of TFP in the economic growth of the analysed countries over the last ten years. In Poland, TFP's contribution to GDP growth averaged 59% in 2013–2022. In Slovakia and Romania, the contribution was very low (15–17%). In Lithuania, Czechia and Estonia, in turn, remarkably high shares (above 100%) were obtained, which is an illusory result due to the residual method of calculating TFP.

Finally, other Polish authors have also researched the breakdown of economic growth and TFP estimates for Poland (leaving aside our research which has already been cited).[2] For example, Florczak and Welfe [2000], and Welfe [2001] calculate TFP in Poland in 1982–2000 on the basis of standard growth accounting with two factors of production: labour and tangible capital (plant and machinery or total fixed assets). In their study, the elasticity of production with respect to fixed assets, i.e., the tangible capital income share, is calibrated at 0.5 or estimated from the production function. In another study by Welfe [2003], the author estimates TFP for Poland between 1986

[2] Due to volume constraints, we will not describe in detail the results contained in these studies.

and 2000 using different alternative values for the tangible capital income share (from 0.25 to 0.7). Florczak [2011], on the other hand, estimates TFP values cleared of short-term demand fluctuations for Poland over the period 1970–2008 using the Wharton method, and then examines the determinants of total factor productivity.

TFP estimates for Poland were also performed for instance by Zienkowski [2001], Rapacki [2002], Piątkowski [2004], and Ptaszyńska [2006]. Roszkowska [2005], and Tokarski, Roszkowska and Gajewski [2005] performed growth accounting for Polish voivodeships, while Bolińska [2018], Dykas and Misiak [2018], and Dańska-Borsiak [2020] performed growth accounting for selected Polish poviats. Zielińska-Głębocka [2004] estimated TFP for 100 industries in Poland, Ciołek and Umiński [2007] calculated TFP growth rates in Polish domestic and foreign enterprises, while Doebeli and Kolasa [2005] used the index number breakdown method for growth accounting for Poland, Czechia and Hungary. Ulrichs and Gosińska [2020] estimated the parameters of sectoral production functions describing the impact of variables representing tangible capital and labour on gross value added in Poland. Młynarzewska-Borowiec [2018] estimated the level and rate of growth of TFP in EU countries, including Poland, in 2000–2014.

It is also worth pointing to research in this area undertaken for Poland at Statistics Poland [Kotlewski, Blażej, 2016, 2018, 2020]. In these studies, the cited authors use KLEMS productivity accounting and estimate for instance the contribution of the economy's multifactor productivity (MFP) to production growth. This empirical study is conducted both at national level (for Poland and selected other EU members) and at the level of Polish voivodeships and individual economic sectors.

6.5. Conclusions

The results indicate that productivity changes have played a significant role in the economic growth of Poland and other EU-11 countries. In Poland, the average TFP growth rate was 1.9% per year over the 2013–2022 period, the second-best result in the EU-11 group (Romania was the leader with 2.3% productivity growth). The increase in TFP in Poland should be interpreted as an improvement in the competitiveness of the Polish economy. Increased factor productivity means increased economic efficiency and a better competitive position in the international environment. The coronavirus pandemic had a negative impact on the rate of growth of TFP. The EU-11 countries suffered a decline in total factor productivity in 2020 and, excluding the successful 2021, not all of them were able to return to a stable path of regular TFP growth by 2022.

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Part II

Competitive Ability and the Role of Health

Chapter 7

Investment and Savings in Poland versus Other European Union Countries

Waldemar Milewicz

7.1. Introduction

The level of private and public savings determines to a significant extent a country's investment opportunities. This statement applies both to economically developed and developing countries [Nowak, Ryć, 2002]. Investment determines the development of the capital stock and is thus an important indicator of macroeconomic production potential [Bardt, Grömling, Hentze, Puls, 2017]. Although almost 90% of all economic investment is private, public investment plays a special role. It not only results from the provision of public goods, but is also very important as a complementary factor to private investment [Bardt et al., 2014].

The increase in public investment is accompanied by various macroeconomic effects. Firstly, it directly contributes to a corresponding increase in gross domestic product. In addition, this can increase short-term demand for private investment and other elements on the side of usage, such as consumption or imports. Finally, a higher level of investment increases the capital stock and thus the ability to do business. In addition, this may affect short-term demand for private investment and other elements on the side of usage, such as consumption or imports. Finally, a higher level of investment increases the capital stock and thus economic capacity and the potential product. However, based on the general equilibrium analysis by Baxter and King [1993], public capital impacts the private capital stock in two opposite directions. The reverse effect on private investment is referred to in literature as the 'crowding-in' and 'crowding-out' effects, as the case may be.

The 'crowding-out' effect means crowding in private investment through state investment. One reason for this may be that government investment increases demand for private goods and enables them to be produced and delivered more efficiently. For example, the state-funded extension of the road transport network simplifies and speeds up transport and trade in goods and services. Thus, private companies

expect an increase in the efficiency of production processes and higher profits, which encourages the private sector to step up investment activity.

On the other hand, 'crowding-out' implies negative causality between public and private investment. In literature, crowding-out effects are traditionally derived from the fact that the state can issue new government bonds to finance public investment. The consequence of the resulting increase in demand for credit is higher interest rates and thus a rising cost of capital. This, in turn, results in more stringent financing conditions for companies, so that investment activity is postponed or may not be undertaken at all [Belitz, Clemens, Gebauer, Michelsen, 2020].

One of the sectors where both public and private investment is present is healthcare. It has been demonstrated that investment in public health systems leads to better results than investment in privatised health systems [Goronga, Brown, Mehta, 2021].[1]

This chapter will analyse how savings and both public and private investment have evolved in recent years in Poland and other European Union countries. In addition, the topic of investment will be addressed in the context of funding allocated to healthcare. The differences in this area in the countries of the European Union will be highlighted here.

7.2. Savings in the EU countries

A number of reports have been published in recent years comparing the savings of citizens in EU countries, but the most authoritative is one published by the European Central Bank in March 2020, titled *The Household Finance and Consumption Survey*. In order to compare the level of net wealth in European countries, the European Central Bank (ECB) provides harmonised micro-data. A standard questionnaire is used to record all relevant assets in order to describe the net wealth of private households. The size of households varies from country to country, and in particular, more people live in a household in Southern European countries than in Central European countries. In the per capita analysis, the differences between countries would therefore be slightly smaller compared to the analysis of household net wealth.

If we first consider the median household net wealth, i.e., the value that demarcates the wealthiest 50% of households from the poorer half, it was EUR 99 thousand for European countries.[2] The highest median household net wealth was recorded in Luxembourg with just under EUR 500 thousand, followed by Malta with around

[1] The essay on this website is part of the series "Manifesto in Defence of Human Life", published on the anniversary of the pandemic announcement.

[2] The bank conducted questionnaire surveys in 2017.

EUR 236 thousand and Belgium with EUR 213 thousand. However, even Spain and Italy, which were heavily affected by the 2008/2009 financial and economic crisis, had relatively high median household net assets of EUR 120 thousand and EUR 132 thousand respectively. At the other end was Latvia, with the lowest net budgetary assets of EUR 20 thousand. For Hungary, the figure was only slightly higher at EUR 36 thousand. The figure for Greece, which was particularly hard hit by the financial market crisis and the subsequent euro crisis from 2008 onwards, was EUR 60 thousand. In Germany, the median household net wealth was around EUR 71 thousand. This value is slightly below the middle range of the countries surveyed and is therefore at approximately the same level as in Portugal (EUR 75 thousand) or Slovakia (EUR 70 thousand) [Halbmeier, Grabka, 2021].

However, if we take into account the structure of the accumulated assets, the situation is as follows in Table 7.1.

Table 7.1. Share of selected types in total household financial in 2021 (%)

	Cash and deposits	Stocks and shares in investment funds	Insurance, pensions and standardised guarantees	Other receivables/ payables	Loans	Other instruments
EU	31.6	32.9	31.1	2.5	0.3	1.6
Eurozone	33.3	31.2	31.3	2.3	0.2	1.7
Cyprus	60.7	20.3	11.6	4.4	0.9	1.9
Greece	57.8	31.2	5.4	4.2	0.1	1.4
Slovakia	52.7	18.7	19.7	5.6	0.1	3.2
Poland	50.5	26.4	12.3	8.1	2.3	0.4
Malta	50.5	26.2	8.3	0.9	6.1	8.0
Croatia	49.0	20.3	27.5	2.2	0.7	0.3
Slovenia	47.8	32.2	12.5	5.1	2.2	0.2
Portugal	46.6	31.1	14.9	2.1	3.8	1.5
Czechia	45.4	39.5	9.9	3.4	0.0	1.7
Luxembourg	45.3	36.6	15.3	0.0	0.4	2.5
Austria	39.8	37.2	18.0	1.6	0.4	2.9
Germany	39.2	25.8	32.9	0.4	–	1.8
Spain	38.4	44.0	14.4	2.6	0.0	0.6
Lithuania	37.0	39.2	11.6	11.4	0.4	0.4
Latvia	37.0	34.9	21.2	4.4	2.0	0.6
Romania	36.3	31.4	11.2	18.7	1.0	1.4
Ireland	35.9	16.2	46.0	1.8	0.0	0.1
Italy	31.9	39.6	23.0	0.8	0.2	4.6

cont. Table 7.1

	Cash and deposits	Stocks and shares in investment funds	Insurance, pensions and standardised guarantees	Other receivables/ payables	Loans	Other instruments
Belgium	30.6	45.1	21.4	1.0	0.0	1.8
Finland	29.9	52.3	15.4	1.8	0.1	0.5
France	29.5	28.8	34.6	6.3	0.2	0.6
Bulgaria	29.3	53.7	10.2	6.4	0.2	0.3
Estonia	28.6	66.8	1.5	2.1	0.7	0.3
Hungary	27.3	42.2	6.7	7.4	3.2	13.1
Netherlands	17.3	15.7	64.9	1.7	0.1	0.2
Sweden	12.2	49.7	35.8	1.7	0.2	0.5
Denmark	11.7	43.6	41.0	1.2	2.0	0.5
Norway	26.2	29.9	31.5	10.3	1.9	0.3
Turkey	73.0	14.0	8.0	1.7	0.1	3.2

Source: Eurostat [2023].

In terms of the share of current deposits in total financial assets, Poland was among the top EU countries, with 50.5%. The largest share of deposits and cash in household assets is recorded in Cyprus (60.7%) and Greece (57.8%). The Danes, on the other hand, hardly ever keep money in current deposits. The popularity of the capital market is evident in countries such as Estonia, Bulgaria and Finland, where more than 50% of citizens invested their savings in stocks and shares in investment funds. The call made in the Capital Market Development Strategy, developed in 2019 by the Polish Ministry of Finance, to increase Polish citizens' investment in the stock market has failed to yield results in practice. This is evidenced by the share in stocks and investment funds that is almost twice as low (26.4%) compared to the EU leaders (thus also lower than the EU average). The situation is even worse in the area of insurance, where the share of Poles in this type of asset is much lower than the European Union average (31.1%) and amounts to only 12.3%. Poland has considerable ground to make up here compared to the best performer in this respect, which is the Netherlands (64.9%). Ireland (46%) and Denmark (41%) are also strong players in this area in Europe.

7.3. Private and public investment

The most important task of private investment is to increase the stock of physical capital in the private sector that can be used for production purposes. The two key factors are the replacement of existing real capital and the creation of additional

stock of capital, including new technologies. It is now common to include human capital in this definition, despite the problems associated with assessing and dealing with the term. Human capital essentially involves investment in the education and training of a workforce, including managers and entrepreneurs, and society as a whole [Lloyd, 1999].

Although private investment is financed from various sources, most of it is still financed from domestic savings. However, access to foreign sources of capital is playing an increasingly important role for the private sector in both developing and developed countries. International sources of capital have therefore become an important part of private investment in developing countries in recent years. Long-term investment flows, particularly foreign direct investment (FDI), are essential to complement domestic development efforts in developing countries, particularly to consolidate infrastructure development, increase technology transfer, deepen production linkages and enhance overall competitiveness [Bayraktar, 2003].

Public investment, in turn, is defined as gross fixed capital formation by the government. This gross investment is the balance of purchases and sales of assets by the federal government or local governments. Fixed assets may include buildings, civil works, means of transport, computer or telecommunications infrastructure, installations, armaments, research and development expenditure [National Bank of Belgium, 2017]. Public investment is key to increasing competitiveness by investing in areas such as research and development, education and healthcare, promoting a well-connected and well-functioning internal market through investment in infrastructure, and mobilising private investment [European Commission, 2023].

In this context, the definition of public investment can also be interpreted more broadly. In neoclassical theory, investment spending comes at the expense of consumption today, when governments face budget constraints, but may benefit future consumption due to positive returns on investment, such as higher economic growth. In this broader context, education spending can also be interpreted as investment due to its positive impact on long-term growth [Hanushek, Woessmann, 2020].

Following the global economic crisis in 2009, the average share of public investment in relation to gross domestic product (GDP) fell for many years in the EU, which broke the trend of rising and stable public investment rates in previous years. The decline in public investment has been particularly pronounced in countries that have had significant fiscal consolidation needs in recent decades, i.e., have experienced high average levels of public debt, such as Greece and Italy. However, countries with medium debt also had lower public investment rates on average after the crisis than before. The largest declines in public investment rates occurred in countries with initially high government and local government investment rates, which in some

cases were linked to the pre-crisis boom, and in countries under market pressure. In particular, public investment to GDP ratios fell in Croatia, Portugal, Spain, Cyprus and Ireland. Secondly, in countries with relatively low levels of government and local government investment in the years preceding the crisis, public investment neither fell significantly nor increased (Belgium, Germany and Austria). Thirdly, public investment has increased in many eastern EU countries, particularly those that have benefited from the increasing use of cohesion funds after EU accession – including Latvia, Poland, Romania and Bulgaria [European Central Bank, 2016]. Considering the post-crisis period, after several years of stable economic growth, public investment started to increase on average in EU countries from 2016/2017, with the exception of high-debt countries that only increased their investment ratio during the last pandemic crisis [Blesse, Dorn, Lay, 2023].

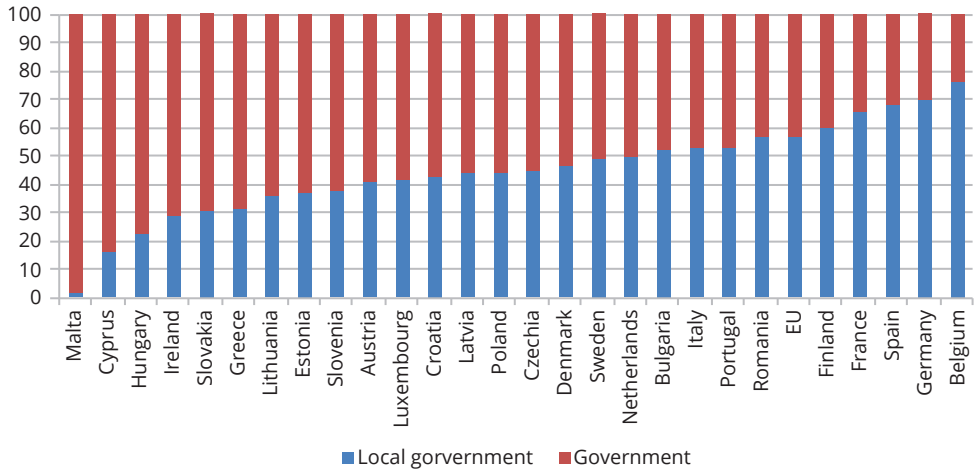
As indicated above, the concept of public investment is inextricably linked to an accounting term, which is gross fixed capital formation. In 2021, this expenditure of the Polish economy increased by PLN 31.2 billion in nominal terms, i.e., by 7.7% y/y. Quarterly investment activity by the different institutional sectors varied significantly in 2020–2021 as a direct consequence of the domestic and global epidemic situation. The decline in interpersonal contacts had a detrimental effect on the overall level of economic activity. While the public sector achieved the highest investment returns in 2020, in 2021 the role of the best-investing institutional sector was taken over by the corporate sector [Polish Ministry of Development Funds and Regional Policy, 2022].

At this point, it is worth looking at the investment initiated by government and local government structures in the country that is an economic leader in the EU. The figures in this regard for this country, with great economic potential, are surprising. Indeed, no EU country invests as little in public infrastructure as Germany. The European average since 2000 has been around 3.7% of GDP per year for roads, school construction and other public investment. Germany's performance is much worse, with an average of 2.1%. Over the period 2011–2021, the German state only invested between 2.10% (2014) and 2.69% (2020) of GDP. In 2021, this figure dropped to 2.6% [VGR Monitor Deutschland, 2024]. The EU-27 average, by comparison, was 3.25% in 2021. This difference cannot be explained in regression analyses by economic, fiscal, demographic or institutional factors, nor by debt restraint. Germany's poor level of investment seems to have become a chronic disease, for which other factors such as prolonged planning procedures and staff shortages are probably responsible [Rösel, Wolffson, 2022].

In the European Union in 2021, there were only two countries with lower public investment in infrastructure than Germany in terms of GDP: Portugal and Ireland. By contrast, Hungary, Estonia, Latvia and Sweden invested the most in relation to GDP [Janson, 2023]. In addition to the amount of funds invested by the state, it is also

worth looking at the structure of this expenditure. The total of EUR 460.9 billion incurred by all EU countries for public investment[3] in 2021 was dominated by the government sub-sector. In 18 of the 27 member states, it represented the majority in the structure. Malta was the obvious leader, with more than 98% of public sector investment expenditure coming from government sources. The reverse situation was the case in Belgium, where government investment accounted for only 24.1% of all public investment. Poland, in turn, was among the countries with the most balanced distribution of public investment between the state and local government sub-sectors, with a share of 44.3% for the local government sector and 55.7% for the sector of government and local government institutions.

Figure 7.1. Structure of public investment in the EU in 2021 (%)

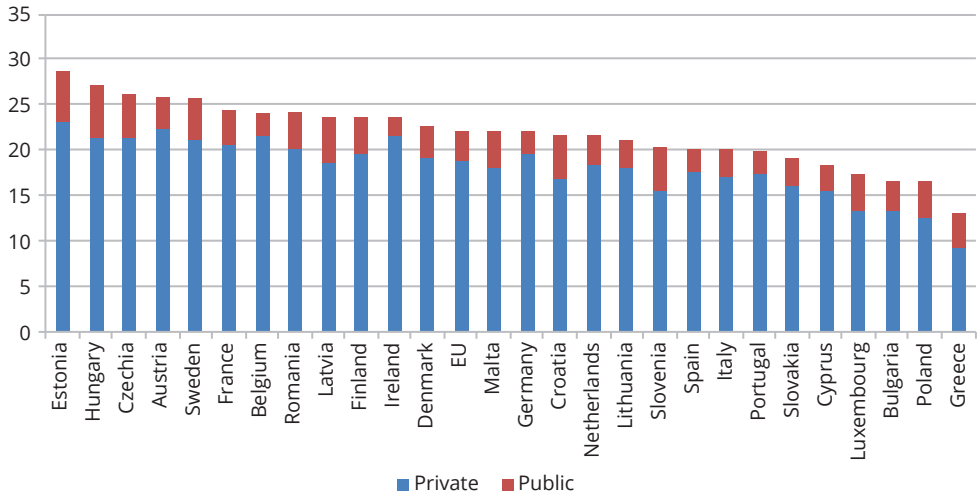


Source: Polish Ministry of Development Funds and Regional Policy [2022, p. 28].

In 2021, the ratio of gross fixed capital formation to GDP, i.e., the investment rate, was around 22.0% in the EU-27, similar to 2020. Looking at the Community as a whole, in 2021, fourteen countries – including Poland with an investment ratio of around 16.6% – achieved a lower average of this ratio than the value for the EU-27. Poland's relatively high public investment rate (4.1% compared to the EU average of 3.2%) means that, when comparing private investment rates, only Greece (9.3%) performs worse than Poland (12.5%). In contrast, Estonia (22.9%) and Austria (22.2%) lead the EU in terms of private investment rate.

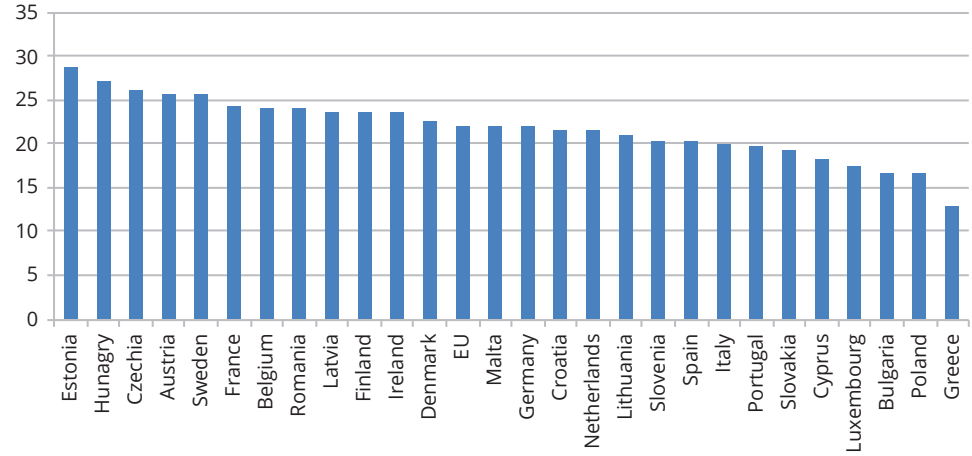
[3] Eurostat's investment data includes housing, roads, bridges, machinery and equipment, but also intangible assets such as computer software.

Figure 7.2. Private and public investment rate in the EU in 2021 (%)



Source: Polish Ministry of Development Funds and Regional Policy [2022, p. 58–59].

Figure 7.3. Overall investment rate in the EU in 2021 (%)

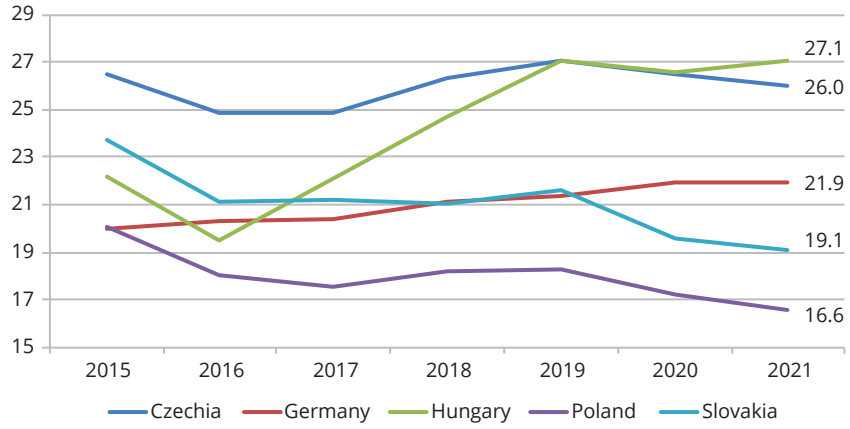


Source: Polish Ministry of Development Funds and Regional Policy [2022, p. 29].

A strong variation in investment activity can be observed in Poland and other V4 countries. Against this background, Hungary's economy stands out with the third highest investment rate across the European Union in 2020, after Estonia and Ireland. The rapid growth of investment in Hungary can be explained by the increased interest of automotive companies in this location in recent years. Czechia also traditionally

performs very well among the V4 economies, with an index of long-term gross fixed capital formation of over 25%. Within the V4 group, Poland's performance is slightly worse, as, since 2016, the investment rate has diverged significantly from the EU average. Although this rate continued to improve in 2018 and 2019, it still did not exceed 19%, which was the lower end of the long-term range until 2015. The decline in the investment rate to 16.6% in 2021 marks the achievement of the lowest result ever for this indicator, which was certainly influenced by the decline in economic activity in the country due to the coronavirus epidemic.

Figure 7.4. Investment rate in selected EU economies in 2015–2021 (%)



Source: Polish Ministry of Development Funds and Regional Policy [2022, p. 30].

The answer to the question about the sources of the decline and simultaneously deterioration of the investment to GDP ratio in Poland in the initial period, i.e., 2015–2016, lies in the coming of the period between the EU 2007–2013 and 2014–2020 financial perspectives, when the inflow of funds slowed. Although the investment to GDP ratio continued to decline in 2017, reaching 17.5%, it was driven by weaker performance in the areas of corporate and household capital expenditure, of which the rate of growth was lower than that of GDP for the second consecutive year.

The year 2020 was a period of negative investment trends in the national economy. The slowdown in economic activity reduced investment demand, particularly from companies, which, fearing the uncertainty of future business conditions, cut back on all spending other than current operations [Polish Ministry of Development Funds and Regional Policy, 2022].

7.4. Investment in healthcare

It is often argued that healthcare expenditure places a heavy burden on the economy and on employees. This view disregards the fact that good healthcare brings enormous economic benefits that extend beyond the economic importance of the health sector. A healthcare system with good medical care and a well-developed rehabilitation system is beneficial for the economy. It contributes significantly to maintaining the earning capacity and productivity of the employed population and helps people to support themselves by their own efforts. Investment in people's health is therefore an important contribution to economic growth, employment and welfare [German Federal Ministry of Health, 2023].

The World Health Organisation (WHO) has thoroughly investigated this relationship and published an interesting study, stating that differences in economic growth between poor and rich countries are half attributable to disease and lower life expectancy in poor countries [World Health Organization, 2022]. This issue was also addressed by the European Commission. Former EU commissioner David Byrne [2003], an expert on health issues, summarised the results of these analyses using the simple phrase "health equals wealth".

This finding was confirmed by the aforementioned study, conducted by the WHO Commission on Macroeconomics and Health. In underdeveloped countries, the classic common diseases of malnutrition, poor drinking water supply, lack of vaccination and other unsatisfactory circumstances were identified as the main causes of their low economic growth. The WHO report made it clear that targeted investment in fundamental health improvements in less developed countries could lead to tremendous economic growth. However, the study was not able to show whether such a correlation also applies to developed and industrialised countries [Commission on Macroeconomics and Health, 2001].This is partly due to the fact that economic growth in developed and industrialised countries is much lower than in developed countries.

In addition, studies at the micro level have shown different mechanisms of action between health and industry growth: for example, they show that healthier citizens work more productively and thus generate higher incomes [Chirikos, Nestel, 1985; Currie, Madrian, 1999]. There are also correlations between other factors that are closely related to health, such as physical fitness, height or weight, and income levels [Averett, Korenman, 1996; Cawley, 2000; Brunello, d'Hombres, 2005]. Another proven correlation is that healthier citizens may spend more time at work, while less healthy citizens take more sick days and retire earlier [Siddiqui, 1997]. It has also been empirically confirmed that better health leads to more hours worked [Pelkowski,

Berger, 2004], and other studies show that better health increases the likelihood of a candidate obtaining an internship or job [Lechner, Vazquez-Alvarez, 2004].

In contrast, research at the macro level continues to support the hypothesis that health is a reliable indicator of economic growth in industrialised countries. There is a correlation between improved population health and investment in human capital, better labour market integration, higher foreign direct investment and productivity growth [Levine, Renelt, 1992; Fogel, 1994; Silverstein, 1995; Kalemli-Ozcan, Ryder, Weil, 2000; Bloom, Canning, Sevilla, 2002; Alsan, Bloom, Canning, 2004; Sala-i-Martin, Doppelhofer, Miller, 2004]. Although these studies refer to different countries and time periods and work with different variables, definitions and models, the results point in the same direction and the conclusions are remarkably consistent: the impact of population health status on economic growth or income levels is often even stronger than that of educational attainment [Barro, 1997]. In summary, at both the micro and macro level, the impact of public health on the functioning of the economy is undeniable [Rahmel, Marx, 2009].

The level of a country's healthcare expenditure and its evolution over time depends on a number of demographic, social and economic factors, as well as the financial arrangements and organisational structure of the healthcare system itself. The COVID-19 pandemic showed that the degree to which a country has been affected by a crisis can also have an impact on overall spending.

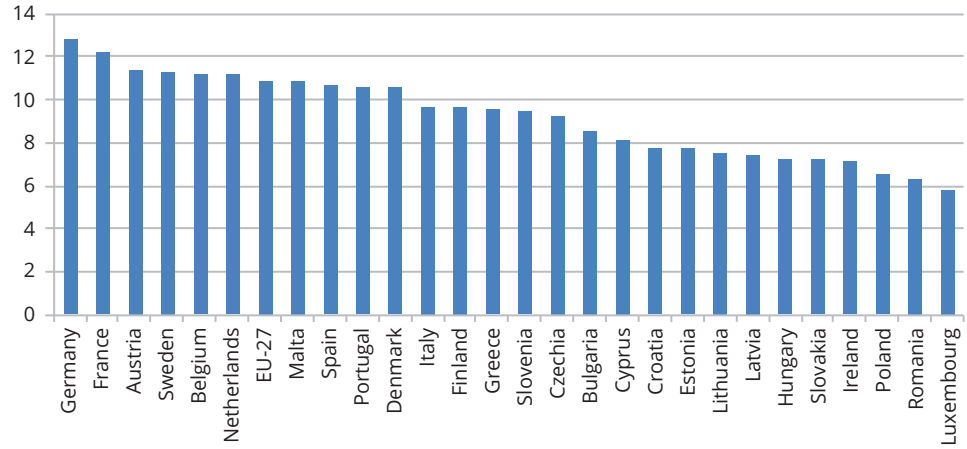
Given these factors, there are large differences in the level and growth of healthcare spending in Europe. With expenditure of EUR 4997 per person, Switzerland was the leading healthcare spender in Europe in 2020. It was followed by Germany (EUR 4831). Spending levels in the Netherlands, Austria and Sweden were also well above the EU average of EUR 3159. At the other end of the scale, Romania, Croatia and Bulgaria were the countries with the lowest spending in the EU, below half the EU average. Healthcare expenditure per capita in Poland amounted to EUR 1591, and therefore the amount spent by Poland on the healthcare of its citizens is twice as low as the EU average. Also, on a per capita basis, there is a threefold difference in healthcare expenditure between high-income countries in Western and Northern Europe and some low-spending countries in Central and Eastern Europe.

How much a country spends on healthcare relative to all other goods and services in the economy, and how this varies over time, depends not only on the level of health spending but also on the size of the economy. In the 1990s and early 2000s, healthcare spending in EU countries generally exceeded other spending in the economy, leading to an almost continuous increase in the ratio of healthcare spending to gross domestic product (GDP), but this trend was disrupted by the 2008/2009 financial and economic crisis. The COVID-19 pandemic also led to fundamentally divergent patterns of growth

in health expenditure and economic output, resulting in a significant correction of this indicator.

In 2020, the EU's healthcare spending reached an unprecedented 10.9% of GDP. Germany and France allocated the highest shares to health, amounting to more than 12% of their GDP. Current spending on health in Germany reached around 12.8% of GDP – the highest figure since 1992. Sweden, Austria, the Netherlands and Belgium also spent more than 11% of their GDP on health. Luxembourg (5.8%), Romania (6.3%), Poland (6.5%)[4] and Ireland (7.1%) had the lowest share of total economic output allocated to health. Across Europe, the United Kingdom and Switzerland were further countries with high health spending (with shares of around 12%), while Turkey allocated the lowest share (4.6%) [OECD/European Union, 2022].

Figure 7.5. Healthcare expenditure in 2020 (% of GDP)



Source: Eurostat [2024].

7.5. Conclusions

In conclusion, in terms of savings and investment, Poland does not present an unequivocally negative picture compared to the European Union countries. Macroeconomic factors (e.g., problems in the labour market, financial crisis, rising prices) increase Poles' propensity to save in order to hedge against a decrease in income or an increase in expenditure in the future (the savings and inventories motive according

[4] In 2020, current expenditure on healthcare in Poland amounted to PLN 151.9 billion according to preliminary estimates of the National Health Account. Thus, it accounted for 6.5% of GDP that year [Statistics Poland, 2022].

to Keynes) [Musiał, 2014]. This can be seen in the structure of assets accumulated by Polish citizens, who, compared to other EU citizens, have a traditional approach to finances, i.e., they either keep cash at home or put it on deposit. This attitude translates into a reduced interest in investment funds, stocks or insurance. Thus, as can be seen, the Capital Market Development Strategy, aimed to change this situation, still has a long way to go in this respect.

Regrettably, as far as investment volume is concerned, Poland remained at the tail end of Europe. While it is true that public investment in 2021 increased by almost 8% y/y and its rate of 4.1% was higher than the EU average of 3.2%, the private investment rate was one of the lowest in Europe (12.5%). In turn, the overall investment rate of 16.6% was lower than the average rate in the EU-27. This pessimistic picture of the Polish economy is complemented by the amount of investment in healthcare – the expenditure in this area in Poland is one of the lowest among EU countries, both in terms of percentage of GDP and per capita. In this respect, our country has a lot of catching up to do, taking as a benchmark the amount of spending in countries such as Switzerland, Germany or France. This is not only in the vital interest of Polish citizens, but, as research by the World Health Organisation has shown, has a long-term positive impact on its economic growth.

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Chapter 8

Labor and Well-Being of Employees in Poland

Anna Maria Dzienis

8.1. Introduction

Nowadays, there is no doubt that employees are vital assets for any business. The OECD [2023a] report underscores that since people spend much of their time at work, companies have a substantial impact on employee well-being. It is also worth stressing that supporting employee well-being fosters inclusive and sustainable growth, benefiting both the company and society [OECD, 2023a].

Likewise, according to the International Labour Organization (ILO), the long-term effectiveness of an organization is significantly influenced by the well-being of its employees. Numerous studies have demonstrated a clear connection between the overall health and welfare of the workforce and productivity levels. Forward-thinking companies are embracing this approach because they recognize that their most valuable assets are their human resources, meaning their employees. Conversely, neglecting the importance of promoting employee well-being can lead to various workplace issues, including stress, bullying, conflicts, substance abuse, and mental health disorders. For those dedicated to creating a more respectful and fulfilling workplace, vital solutions like effective leadership, communication, and a strong emphasis on learning and development are indispensable [ILO, 2023].

Furthermore, Future Workplace Academy has proposed "seven pillars of employee well-being" for leaders to follow as they make employee well-being a top priority [Meister, 2021]. Those foundational principles or specific dimensions of wellness are physical, career, financial, social, community, emotional, and purpose. Physical well-being encompasses a variety of factors such as physical activity, sleep, overall lifestyle, and dietary choices. It emphasizes the significance of daily habits to improve one's physical health. Next, career-related well-being is connected to talent strategies aimed at retaining employees. It also underscores improved learning and development initiatives, fresh internal opportunities for talent mobility, and online coaching and resilience training to support employees in coping with significant disruptions and evolving work practices. Caring about financial wellness means, e.g., providing an emergency savings

account that can be set up for automatic deductions from an employee's salary, aiding them in saving for unforeseen expenses. Then, social well-being implies that employers are recognizing the need and introducing fresh initiatives to bring social interactions to employees as they continue to work from remote locations. Moreover, fulfilling the community aspect of well-being caters employees with chances to engage in their local community, which will strengthen their connections to their employer, the local community, and the environment. Securing emotional well-being means that companies are proactively working to reduce the stigma around mental health and establishing new commitments for the hybrid workplace. These commitments, centered mostly on inclusivity and flexibility, underscore the belief that work is defined by what one accomplishes to produce results, not by physical location. Finally, embracing purpose-related well-being means opting to work for organizations whose values align with those of an employee, and this will be a critical factor when choosing a new employer [Meister, 2021]. In sum, it can be said that the seven pillars of employee well-being define a human-centered approach to an organization.

Accordingly, in Poland, a growing number of companies are recognizing the significance of implementing or improving policies aimed at fostering the well-being and welfare of their workforce. The COVID-19 pandemic played a significant role in accelerating this trend, resulting in a shift in the dynamics of employer–employee relationships and work arrangements in numerous organizations [Oramus, 2023]. It needs to be stressed that managerial approaches that enhance the welfare of employees also yield advantages for employers. Over time, organizations that prioritize the health and well-being of their workforce are more likely to foster a reciprocal commitment from employees who, in turn, are concerned about the organization's welfare. This is a desired outcome for all effective leaders [Kelly, Berkman, Kubzansky, Lovejoy, 2021]. It also benefits the economy as a whole.

In 2023, Poland witnessed the most significant improvement, compared to the previous year in its labor market index, as reported by the IMD *World Competitiveness Ranking* [IMD, 2023a]. This improvement was determined by the following factors: percentage change in long-term growth of the labor force, university education index, efficiently implemented apprenticeships, available skilled labor, development and application of technology, and health infrastructure that meets the needs of society. As described by respondents, the key factors that made Poland's economy attractive included the dynamism of the economy, a skilled workforce, cost competitiveness, open and positive attitudes, a high educational level, and effective labor relations. Nevertheless, despite the growing potential, in the IMD *World Competitiveness Talent Ranking 2023*, Poland was ranked relatively low, 44th out of 64 countries [IMD, 2023b].

In particular, attracting and retaining talents, as well as quality of life, were among the factors with the worst performance.

The aim of this chapter is to outline labor competitiveness and the well-being of the workforce in Poland. Labor competitiveness can be measured by means of metrics such as the unemployment rate, employment, wages and salaries, job creation, and the job vacancy rate. However, evaluating employee well-being presents its own challenges, even with the emergence of various methods involving the use of proxy indicators, including employee satisfaction, turnover rates, absenteeism, healthcare expenses, financial results, and the implementation of support programs [Oramus, 2023, p. 24]. For the purpose of this chapter, statistics such as labor productivity, the number of employed adults working from home, absenteeism, and benefits are examined.

8.2. Labor competitiveness in Poland

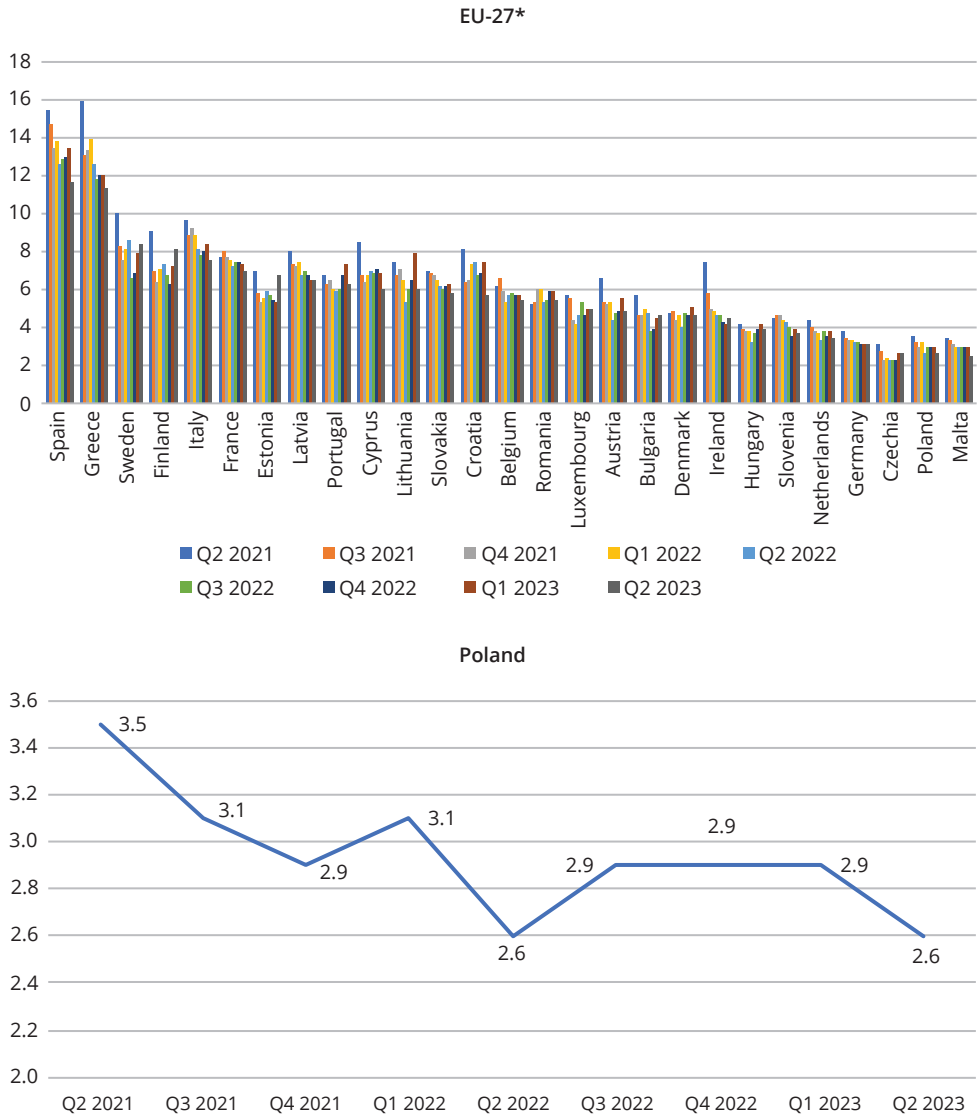
8.2.1. Unemployment

According to the Eurostat labor force survey (LFS), the total unemployment rate in Poland went down from 3.4% in 2021 to 2.9% in 2022 (with the total registered unemployment rate calculated by Statistics Poland at 5.2%). In the second quarter of 2023, the unemployment rate (measured by Eurostat) reached 2.8% (5.1% in terms of registered unemployment data from Statistics Poland) and did not change compared to the second quarter of 2022. In the second quarter of 2023, the unemployment rate for females was lower than for males (2.7% and 2.9%, respectively), similar to the previous quarters. Since the first quarter of 2019, the unemployment rate reached a five-year peak in the first quarter of 2021 (see Figure 8.1), 3.8% for males and 3.7% for females. Subsequently, according to the monthly data from Statistics Poland Local Data Bank [2023], from the beginning of 2022 until September 2023 no significant changes in the inflow into the unemployment rate were observed.

At the end of the second quarter of 2023, the share of women accounted for approx. 53.4% of the total number of unemployed, showing a decrease of 1.4 p.p. with regard to the same period of the previous year. At the same time, people aged 35–44 constituted the largest group in the total number of unemployed (26%), while people aged 25–34 accounted for a 25% share in unemployment. The majority of individuals who register as unemployed with labor offices tend to have lower levels of education. This group includes individuals with lower secondary, primary, and incomplete primary education, as well as basic vocational/sectoral vocational education. Their collective percentage among all unemployed persons increased to 58.4%, up from

50.9% in June 2022. Notably, the educational composition of unemployed women differed from that of men, with 58.4% of unemployed women having secondary and tertiary education, whereas only 38.7% of men possessed education at these levels [Statistics Poland, 2023a].

Figure 8.1. Unemployment rate in the EU-27 and in Poland (quarterly data, seasonally adjusted – percentage of population in the age of 15–74 in the labor force, %)



* The values displayed signify the unemployment rate in the second quarter of 2023.

Source: own elaboration based on Eurostat [2023b] data.

Furthermore, the substantial number of Ukrainian citizens registering at employment offices hasn't adversely affected the positive trends in the Polish labor market. In comparison to the conditions at the end of January 2022, prior to the commencement of the conflict in Ukraine, there has been a reduction of over 14% in the number of unemployed individuals, resulting in a 0.8 p.p. decline in the registered unemployment rate [WUP Kraków, 2022].

8.2.2. Employment and gross wages and salaries in the national economy

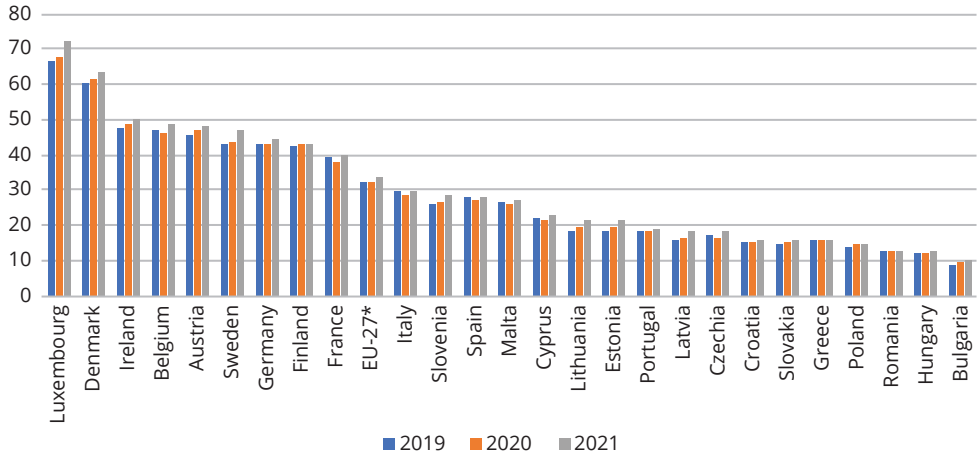
The number of employed persons in the national economy (end of period) increased in the second quarter of 2023 by 43.3 thousand people compared to the same period of the previous year. The growth of employment for both the first and second quarters of 2023 reached 0.5% y/y and was lower than in the first and second quarters of 2022 (increasing by 1.8% and 1.6% respectively). Even though the number of employed people increased in the second quarter of 2023 compared to the same quarter of 2022, employment in several industries continued to shrink. The highest decreases could be seen for people employed in construction, 1.9%, and for those employed in manufacturing, 0.9%. On the other hand, employment in information and communication increased by 5.2% (compared to an increase of 11% y/y in the second quarter of 2022). Moreover, transportation and storage continued to grow, by 2.6% in the second quarter of 2022, and 2.1% during the corresponding quarter of 2023, while, despite previous decreases, employment in financial and insurance activities grew by 3.7% y/y in the second quarter of 2023 [Statistics Poland, 2023a].

As far as the average monthly gross earnings and salaries in the national economy are concerned, the mean monthly gross salary in Poland for the year 2022 stood at PLN 6346.15. This marks a nominal increase of 11.7% compared to 2021, which is a more significant uptick than the 8.7% increase recorded in 2021 when compared to 2020. The average monthly gross wages displayed variation across different NACE sections. In 2022, they ranged from PLN 4127.68 in the accommodation and catering section to PLN 11 101.46 in the mining and quarrying section. This indicates a respective decrease of 35.0% and an increase of 74.9% compared to the national average monthly gross salary [Statistics Poland, 2023c].

From December 2022 Eurostat publishes a new indicator on annual average salaries in the EU. According to these statistics, the EU recorded an average annual full-time adjusted salary of EUR 33.5 thousand for employees in 2021 (see Figure 8.2). This indicator is employed to calculate the average gross annual salary for each EU member state and to issue working permits to high-skilled workers as per the Blue

Card Directive [Eurostat, 2022b]. According to the data, Poland ranks fourth from the bottom.

Figure 8.2. Average full time adjusted salary per employee in selected EU countries (EUR thousands)



* From 2020.

Source: Eurostat [2022b].

8.2.3. Labor market transition

As for the Eurostat's data on labor market flows, out of all unemployed persons in Poland in Q4 2022, approximately 53% (51% in the EU) remained unemployed, 17% (24% in the EU) moved to employment and 30% (25% in the EU) moved to the status of inactivity, in Q1 2023 (see Table 8.1).

Table 8.1. Transition in labor market status in Poland and in the EU-27 from Q4 2022 to Q1 2023 (% of initial status, seasonally adjusted data, not calendar adjusted data)

	Employment	Unemployment	Inactivity
Poland	98.9	0.4	0.6
	16.9	53.4	29.8
	1.7	1.5	96.7
EU	96.4	1.2	2.4
	24.2	51.1	24.7
	4.3	3.3	92.4

Source: own elaboration based on Eurostat [2023a] data.

Clearly, in comparison to the EU-27 population, Polish individuals exhibit a lower rate of transitioning from unemployment to employment. Conversely, they have a greater likelihood of transitioning from unemployment to inactivity. Within the inactivity group, there is a noticeable decrease in the frequency of transitioning between different statuses.

8.2.4. Job creation

The percentage change in gross value added by selected sectors reveals the following facts. The highest growth was observed in financial and insurance activities, agriculture, forestry and fishing, as well as transportation and storage. On the other hand, the most significant decline, nearly 16%, was seen in electricity, gas, steam and air conditioning supply, which falls under the category of 'industry' (see Table 8.2).

Table 8.2. Percentage change in gross value added in selected sectors in 2022 related to 2021 (change dynamics, fixed prices, value of the consumer price index in 2022 = 114.4, and in 2021 = 100)

Sectors	2022/2021
Financial and insurance activities	60.9
Agriculture, forestry and fishing	47.7
Transportation and storage	28.8
Accommodation and catering	25.9
Other service activities	23.7
Arts, entertainment and recreation	22.9
Construction	20.9
Information and communication	19.9
Trade; repair of motor vehicle	18.5
Professional, scientific and technical activities	17.6
Real estate activities	15.5
Industry*	15.4
Administrative and support service activities	15.0
Public administration and defence; compulsory social security	13.8
Activities of households as employers and products-producing activities of households for own use	12.9
Education	7.0
Human health and social work activities	6.5

* Includes: mining and quarrying, manufacturing, water supply; sewerage, waste management and remediation activities, electricity, gas, steam and air conditioning supply, mining and quarrying.

Source: own elaboration based on Statistics Poland [2023d].

In terms of newly registered companies in the National Court Register (KRS), in the end of the second quarter of 2023, a total of 28 134 entities were recorded in the National Court Register (KRS). Should this pattern continue in the latter half of the year, the registrations for 2023 will surpass 56 thousand, matching the record-setting figures from 2021 [COIG, 2023]. According to COIG [2023], the most frequently registered NACE sectors in the first half of 2022 were as follows:

1) wholesale and retail trade; repair of motor vehicles (18.4% of the total number of new companies registered in the first half of 2023),
2) professional, scientific and technical activities (14.3%),
3) construction (13.7%),
4) information and communication (7.9%).

Within these sectors, the most commonly declared divisions were: freight transport by road, computer programming activities, business and other management consultancy, retail sales conducted by mail-order or online retailers, and the development of building projects [COIG, 2023].

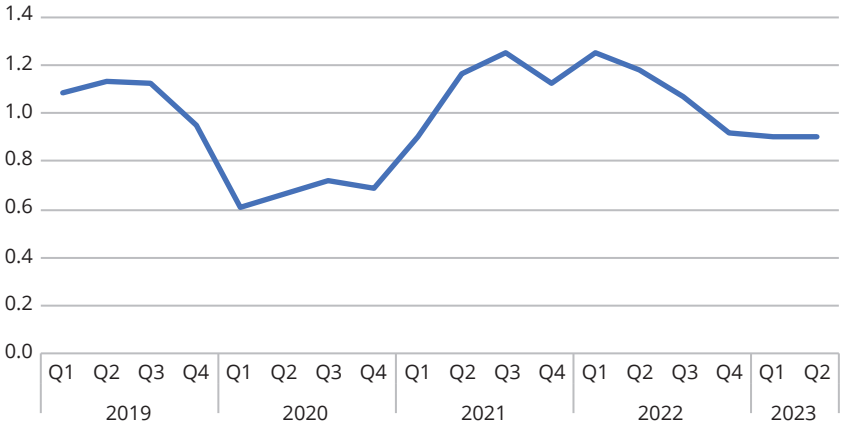
Between January and the end of October 2022, district labor offices received reports of 1053.5 thousand job and vocational activation opportunities, constituting an 8.5% decrease in the number of job offers [WUP Kraków, 2022]. In August 2023, the legal professions saw the most substantial year-on-year increase in the number of job offers, marking a growth of 24%. Conversely, the most pronounced reductions were seen in the HR sector, 35%, IT, 29%, finance, 20%, and marketing and sales, 11% [PARP, 2023]. Moreover, in September 2023, approximately 257 300 new job listings were published by employers on Poland's 50 largest job recruitment websites. This represents an 18% decline compared to the corresponding month in 2022, constituting the most significant decrease since January 2021. The most substantial decline in demand for employees was evident in the IT sector, with a notable 52% reduction in job openings compared to the prior year. In various other sectors, decreases in job demand were also observed, including HR, 29%, finance, 28%, and marketing, 23% [Gran Thorton, 2023].

8.2.5. Job vacancy rate

At the end of the first half of 2023, the overall job vacancy rate in Poland fell below 1% (see Figure 8.3). Still, the highest rate, at 2.25%, was observed in the information and communication NACE section, primarily due to a shortage of professionals. This was followed by the construction section (1.6%), where the most vacancies were recorded for craft and related trades workers. Finally, in the transportation and storage section (1.41%), the highest unmet demand was observed for plant and

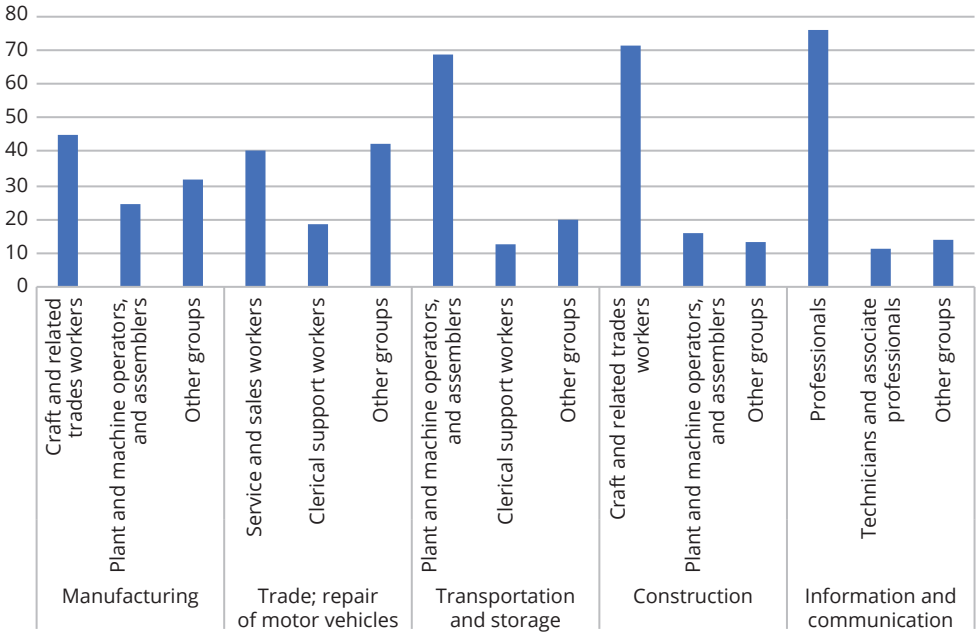
machine operators and assemblers (see Figure 8.4). The job vacancy rate was above 1% in six regions: Zachodniopomorskie, Warsaw metropolitan, Lubuskie, Małopolskie, Pomorskie, and Dolnośląskie.

Figure 8.3. Job vacancy rate in Poland from Q1 2029 to Q2 2023 (%)



Source: own elaboration based on Statistics Poland [2023b].

Figure 8.4. Structure of job vacancies in selected NACE sections by major occupational group in Q2 2023 (%)



Source: Statistics Poland [2023b].

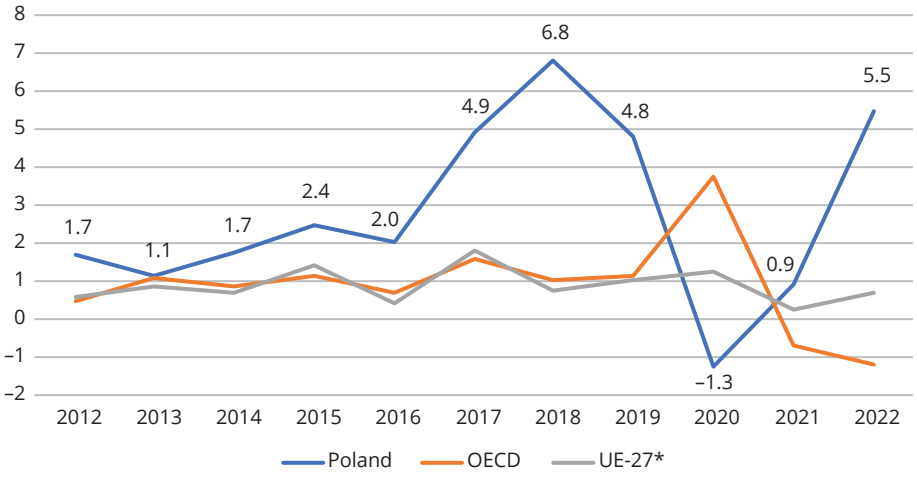
The findings from the Occupational Barometer suggest that in 2023, there will be a further decrease in the demand for workers. Nevertheless, the report states that owing to preexisting workforce shortages, it is unlikely to witness a substantial increase in unemployment leading to an oversupply of labor. The labor market is expected to move closer to a state of balance [WUP Kraków, 2022].

8.3. Indicators attributed to the health and well-being of employees

8.3.1. Productivity, employee efficiency

According to OECD [2023b], the growth in labor productivity is a crucial element of economic performance and a fundamental factor influencing changes in living standards. The increase in per capita GDP can be analysed by breaking it down into two components: growth in labor productivity, which is measured as the growth in GDP per hour worked, and changes in labor utilization, which is measured by variations in hours worked per capita. High growth in labor productivity can be indicative of increased capital usage, a reduction in the employment of low-productivity workers, or overall efficiency improvements and innovation. Labor productivity and utilization in Poland grew significantly after 2020 (see Figure 8.5).

Figure 8.5. Annual growth rate labor productivity and utilization in Poland, EU-27 and OECD in 2012–2022 (%)

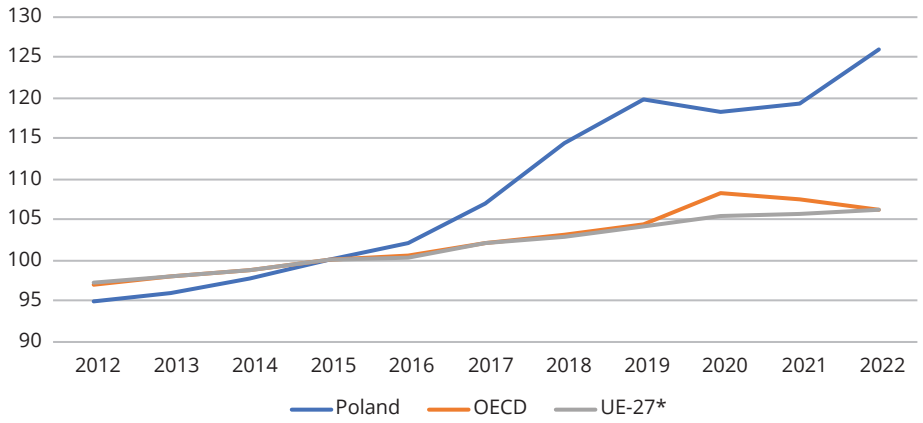


* From 2020.

Source: OECD [2023b].

As a result, Poland is expected to observe an increase in the forecasted labor productivity index.

Figure 8.6. GDP per hour worked in Poland, EU-27 and OECD in 2012–2022 (2015 = 100, USD)



* From 2020.

Source: OECD [2023c].

GDP per hour worked quantifies how efficiently the labor input is integrated with other production factors in the production process. For Poland, the indicator has substantially improved since 2015 (see Figure 8.6), ranking the country fourth in the OECD 2023 statistics [OECD, 2023c].

8.3.2. Working from home

When it comes to the percentage of employed adults working from home, Poland scores poorly compared to other EU countries. According to the data published by Eurostat [2023c], in Poland, there were 12.7% of employed adults working from home in 2022, compared to 18.2% in 2020 and 15.5% in 2021. The rate for men was nearly 12% in 2022, the lowest since 2013, and for women, it was 13.6% in 2022, also the lowest since 2013. In the EU-27 countries, the proportion of employed people working from home was 21.5% in 2022, 20.6% in 2020, and 23.3% in 2021. The highest rates were observed in the Netherlands, with nearly 50% in 2022, followed by Sweden at 43%, and Finland at 41%. In contrast, the lowest rates were reported in Romania at 4.3% and Bulgaria at 4.4%.

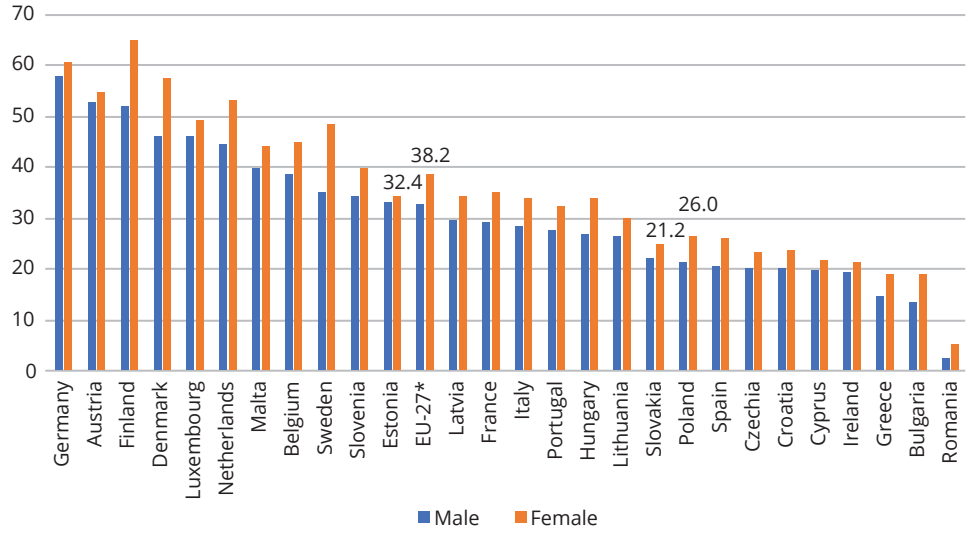
It is worth mentioning that in the context of employee well-being, the notion of 'work-life fit' is becoming increasingly relevant today. It has emerged as a response

to the previously prevalent 'work-life balance' concept, which advocated for a clear separation between personal and professional life. The concept of work-life fit proposes a more harmonious integration of these two life aspects as in today's reality, to some extent, it is feasible to blend professional responsibilities with family commitments or the pursuit of personal passions [Oramus, 2023].

8.3.3. Absence from work

Absence from work in Poland reached the level of 23.3% in 2019, while EU-27 average stood at 35%. The indicator is higher in cities, 27% in Poland, 37% in the EU-27. The percentage of people absent from work slightly increased in Polish and European cities compared to 2014 [Eurostat, 2022a].

Figure 8.7. Absence from work due to personal health problems in the EU-27 based on survey conducted in 2019 (% of employees by sex)



* From 2020.

Source: Eurostat [2022a].

Over the years, there has been a consistent prevalence of female absenteeism. The proportion of certificates issued to women remains around 55% of all certificates issued. In 2022, it reached 55.5%, and in previous years, it was 54.8% in 2021 and 55.3% in 2020. Furthermore, as in the previous year, individuals aged 30–39 continued to have the lengthiest sick leave periods, making up 27.5% of the total days off due to illness. Approximately 24% of sick leave days were attributed to men aged 40–49,

and more than 22% to men aged 30–39. Among women, over 31% of the total days off were taken by those aged 30–39. Expenses for sickness absences financed by the Social Insurance Fund (FUS) and labor funds have been steadily increasing for several years. In 2022, the total expenditure on sick leave reached PLN 25 487.8 million. During this period, the Social Insurance Fund covered 57.2% of these costs, while the remaining expenses were borne by employers and the Guaranteed Employee Benefits Fund (FGŚP) [Sikora, Karczewska, 2022].

According to the Social Insurance Institution (ZUS) information in the initial two months of 2023, a total of 5.1 million medical leave certificates were received by the ZUS. The predominant reason for absences was related to respiratory system illnesses. In comparison to the equivalent period in 2022, there was a rise in both the count of sick leave days – by 8.6%, as well as the number of medical certificates – by 16.1% [Infor, 2023].

8.3.4. Employee benefits

From the start of 2023, the typical number of perks in job listings, like sports memberships, private healthcare, or insurance, has maintained a steady level of around 6.5. This pattern persisted in September as well, with an average of 6.6 job offers compared to 6.4 previously. The most common benefits offered include training, medical packages, and competitive salaries [Gran Thorton, 2023].

A survey conducted by the Lewiatan Confederation regarding the influence of the pandemic on business operations indicated (Figure 8.2) that 71% of employers have yet to provide psychological support (e.g., access to an online platform with advice, training, or individual sessions with psychologists). Nevertheless, the pandemic period has led to a notable rise in the appeal of this benefit, increasing by nearly half (from 20% to 29%), raising expectations for the continuation of this trend [Oramus, 2023].

8.4. Conclusions

The relatively low unemployment rate continues to persist, indicating the strength of the labor market in Poland. Moreover, the workforce is characterized by highly educated and skilled employees. Concurrently, GDP per hour worked increases, revealing the increasing efficiency of employees. However, it is worth noting that several trends are already present and emerging in the Polish labor market, demanding careful consideration and further research. One is that unemployed individuals, including a significant number of highly educated women, show a low likelihood of

transitioning to employment. This can be seen as lost potential. Second, in Poland, we can observe a relatively low percentage of people working from home and a growing rate of absenteeism, particularly among females. It indicates that there is limited flexibility in terms of work arrangements, a lack of employer trust in employees, and a prevailing belief that work is still defined by physical location rather than by the results one produces. Such an approach to employees hampers inclusivity. Furthermore, the structure of job offers, and consequently the economy, has been changing. We could notice a significant decrease in IT job offers until August 2023, despite their high demand in previous years. This may signify a shift towards more specialized qualifications among IT staff. All these factors combined affect employees and society. Therefore, for the sake of an organization's present and future well-being, it is important to take a human-centered approach to human resources and care about vital assets, people.

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Chapter 9

Poland's Innovativeness Compared to the European Union in the Context of Health-Related Industries

Arkadiusz Michał Kowalski, Małgorzata Lewandowska, Marzenna Anna Weresa

9.1. Introduction

The COVID-19 pandemic increased the interest of researchers, economic policy makers and general society in public health innovation, with particular relevance to the acceleration of innovative digital solutions in the health-related industries and the health system as a whole.

The aim of this chapter regarding its macroeconomic part, is to determine Poland's innovativeness in the area of health compared to selected developed countries.

Another aim of the chapter, defined at a mesoeconomic level, is to explore, the concentration of innovation activities, discuss the importance of clusters in high-tech industries, which include the pharmaceutical industry, and describe the development of clusters related to the areas of medicine, pharmacy and quality of life in Poland.

When combining the meso- and the microperspectives this study also aims to determine the level of innovativeness of entities in the Polish pharmaceutical industry compared to innovativeness of the peers in selected European countries.

The chapter is divided into six sections, focusing on innovation analysed from the macro-, meso- and microeconomic perspective. The final, sixth section concludes.

9.2. Innovation of the Polish economy and public health – a macroeconomic perspective

The innovation process involves many interrelated elements that lead to the development and implementation of a new product or business process, including changes in marketing, business organisation, or business model [OECD/Eurostat, 2018]. Innovations are driven by multiple elements, including the physical and human

resources available in the economy and their quality, the state of development of science and technology and the rate of technical progress, innovation policy, the business environment, and the links and interfaces between these elements. All these factors can be described as an innovation ecosystem. Depending on the aggregation level or territorial coverage adopted, a distinction can be made between national, regional, metropolitan, sectoral and technological innovation systems. The National Innovation System (NIS), which is examined in this section of the chapter, is defined in many ways in literature [e.g., Freeman, 1989, 2001; Nelson, 1992; Lundvall, 2007; Edquist, 2003]. A synthesis of many definitions makes it possible to explain NIS as the following interrelated elements and how they interact [Weresa, 2012, 2022]:

- stakeholders involved in the creation of new knowledge and the generation of innovation, commercialisation and diffusion,
- institutions that create an environment for the development of science, technology and entrepreneurship,
- knowledge resources accumulated in an economy.

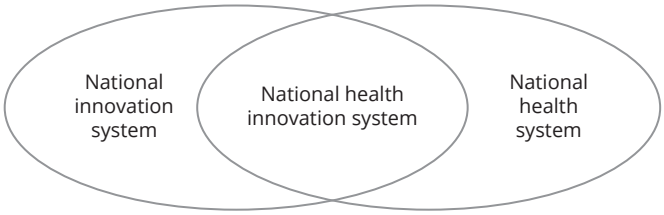
In the context of the focus of this chapter, which is innovation in the public health system, the question arises as to how the NIS concept is linked to innovation in the public health system. In the literature, this area has been conceptualised as a medical innovation system [Ramlogan, Mina, Tampubolon, Metcalfe, 2007, p. 475], and further studies on this issue have shaped the notion of a national health innovation system (NHIS) [Cassiolato, Soares, 2015; Proksch, Busch-Casler, Haberstroh, Pinkwart, 2019]. However, it is debatable whether the scope of this concept is national or if it is rather an industry-based innovation system for health-related industries [Proksch et al., 2019]. However, in a broad sense, according to which the health innovation system consists of a whole range of production and service industries as well as a number of policies relating not only to medical industries, but also to public health, the concept of a national health innovation system (NHIS) seems to be fitting.

The national health innovation system is defined from the perspective of its two components:

- innovation activities of economic operators, social actors and organisations involved in the delivery of healthcare, including production, financing and R&D in medical and related industries,
- institutions and standards that are in place in the national innovation system, particularly relating to health, and the activities of public health facilities in the national health system [Chataway, Tait, Wield, 2007; Cassiolato, Soares, 2015].

This definition is supported by many researchers studying the issue, considering the NHIS as a subset of a country's NIS [Cassiolato, Soares, 2015; Proksch et al., 2019], as shown in Figure 9.1.

Figure 9.1. National health innovation system (NHIS) and its links to the national innovation system



Source: Cassiolato, Soares [2015, p. 34].

Taking such a broad definition and therefore a broad concept as a starting point, it is worth focusing on its operationalisation. When conducting a comparative analysis of the state of development of the NHIS in 1997–2015 in 35 developed OECD countries, Proksch et al. [2019] used a set of variables, which were classified into two groups:

1) health innovation output – four variables describing knowledge production (medical patents and publications per million population) and knowledge commercialisation (value added of the pharmaceutical industry and balance of foreign trade in pharmaceutical products as a percentage of GDP),
2) healthcare system variables – eight variables such as health expenditure, number of doctors and hospital beds, medical staff per number of hospital beds, percentage of workforce employed in hospitals, number of patient consultations with doctors, number of CT and MRI scans, average length of hospital stay, percentage of population over 65 years of age.

Based on the variables in the two groups described above, four different types of NHIS existing in OECD countries were identified. A hierarchical cluster analysis according to Ward's method with squared Euclidean distances was used for this. An interesting finding of this research is that there is no clear link between the development of NIS and NHIS.

Table 9.1 lists the OECD countries included in each NHIS type, together with the average scores of the first of the groups of indicators relating directly to health innovation activities.

The type designated as D was considered to be the most advanced NHIS, which includes Switzerland, the Scandinavian countries and the Netherlands. Poland, like two other EU countries from the Central European region, i.e., Hungary and Slovakia, represents the weakest NHIS type designated by Proksch et al. [2019] as cluster B. Countries included in this type of NHIS had on average the poorest performance of health innovation activities, with the exception of the patent indicator, where they ranked second. This is a highly heterogeneous group of countries in terms of

geographical location, economic profile or cultural characteristics. Most EU countries were included in the NHIS group designated as type A, which could be referred to as the 'European NHIS', as it only includes countries located on the European continent. In turn, the NHIS type designated as C ranked second and can be referred to as the 'Anglo-Saxon NHIS' due to the countries included (e.g., the United Kingdom, Ireland, the United States, Australia), although it also includes other countries, such as Austria, Belgium and Finland.

Table 9.1. Average health innovation performance by NHIS type: Poland's place compared to OECD countries

	Type A	Type B	Type C	Type D
Specification	Czechia Portugal Germany France Italy Greece Spain	Japan South Korea Hungary **Poland** Slovakia Turkey Chile Mexico	Australia New Zealand Israel USA Canada Austria UK Ireland Belgium Finland	Switzerland Denmark Norway Netherlands Sweden
Average number of health-related patents per million population	8.76	48.07	122.65	15.49
Average number of medical publications per million population	626.18	267.12	1087.78	1728.82
Value added of the pharmaceutical industry (% of GDP)	6.00	3.00	8.00	13.00
Balance of foreign trade in pharmaceutical products (% of GDP)	0.49	0.38	1.87	2.54

Source: own elaboration based on Proksch, Busch-Casler, Haberstroh and Pinkwart [2019, pp. 5–6].

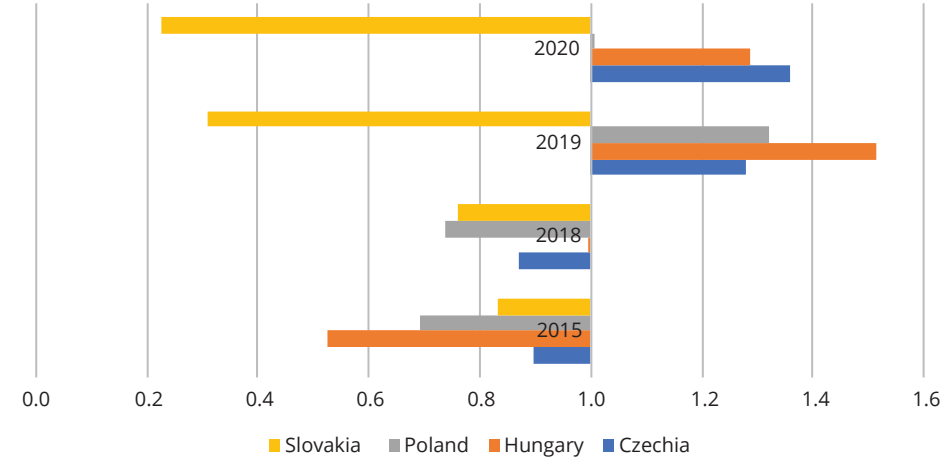
Regarding Poland's place in comparison with other OECD countries by the NHIS type designated as B, it should be noted that this group achieved a relatively good result (the second place) in terms of the average number of health-related patents. It is therefore interesting to examine this indicator in more detail. For this purpose, data on the number of worldwide patent applications filed at the European Patent Office (PCT) from the World Intellectual Property Organisation (WIPO) database was used. Patents in medical technologies (A61 under the International Patent Classification) related to the total number of patents allowed to determine whether Poland has a relative advantage in medical technologies. The Relative Technological Advantage (RTA) index for Poland was calculated using the following formula:

$$RTA_{ij} = \frac{\frac{P_{ij}}{\sum_i P_{ij}}}{\frac{\sum_j P_{ij}}{\sum_i \sum_j P_{ij}}} \tag{9.1}$$

where:
P_{ij} – number of patents of country i in j technologies,
$\Sigma_i P_{ij}$ – total number of patents worldwide in j technologies,
$\Sigma_j P_{ij}$ – total number of patents of country i,
$\Sigma_i \Sigma_j P_{ij}$ – total number of patents worldwide.

The RTA index identifies a country's international specialisation in a selected technical field. When the index equals to one, the share of a country's patents in a given industry is the same as the country's share in the total number of patents worldwide. An RTA value greater than one indicates a country's relative advantage in a given technological area relative to the world, while an index lower than one indicates no such advantage. EU countries from Central Europe, i.e., Czechia, Hungary and Slovakia, which are similar to Poland in terms of the level of development and technological advancement were selected for comparison. RTA indices for Poland compared to selected EU countries from Central Europe and their evolution over the period 2015–2020 are presented in Figure 9.2.

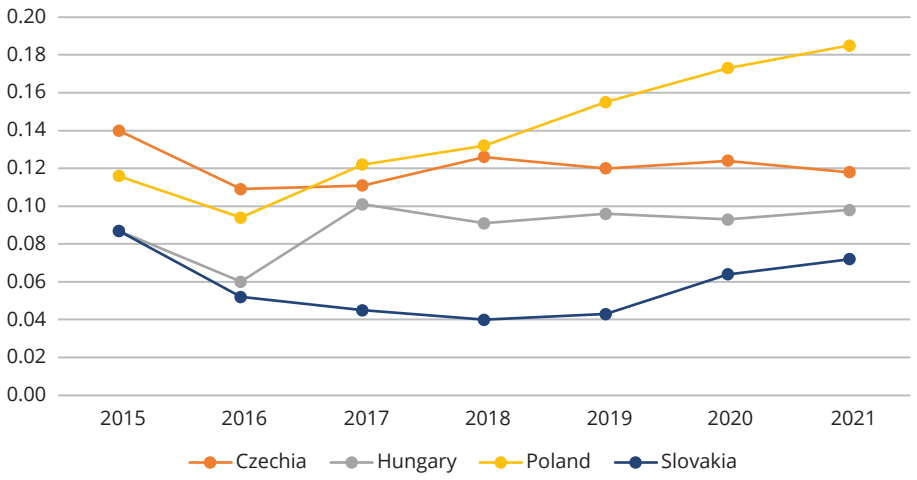
Figure 9.2. The evolution of technological advantages (RTA) in medical technologies in Poland compared to selected EU countries in 2015–2020



Notes: RTA > 1 indicates advantages in a given technology, while RTA < 1 indicates no advantages.
Source: own elaboration based on WIPO data.

In terms of medical technology specialisation, significant changes can be noted that have taken place in the analysed countries over the period 2015–2020. In 2015, Poland, like the other EU countries from Central Europe, had no relative specialisation in the area of medical technologies. Gradually, this situation changed and since 2019, Poland, Czechia and Hungary have had relative advantages in medical technologies, while the lack of specialisation in these technologies in Slovakia. An important factor influencing innovation in medical technologies as measured by patent indices is R&D expenditure in the field of medical sciences [Hegerty, Weresa, 2022]. Analysis of the statistical data shows that over the period of 2015–2021, there was an increase in medical R&D expenditure in relation to GDP in all the countries analysed, with Poland showing the highest growth rate (Figure 9.2). Slovakia, which has no comparative advantage in medical technologies, has the lowest level of R&D expenditure in medical sciences among the countries analysed. It may indicate that this county might not yet have reached the critical mass necessary to achieve relative technological specialisation in this area.

Figure 9.3. R&D expenditure in medical sciences in Poland compared to selected EU countries in 2015–2021 (% of GDP)



Source: own elaboration based on data from Eurostat database.

9.3. Development of medicine, pharmacy and quality of life clusters in Poland

The pharmaceutical industry, which is included in statistical summaries under the heading 'manufacture of basic pharmaceutical products and pharmaceutical preparations' (Division 21 of the Polish Classification of Activities, PKD), is one of the high-technology industries in the OECD classification [Hatzichronoglou, 1997], which includes high-technology, medium-high-technology, medium-low-technology and low-technology industries. At the same time, existing studies [Arauzo-Carod, 2021] indicate a strong concentration of high-tech industries in large metropolitan areas with high access to (financial, human, social, relational, etc.) capital and strong knowledge flows. As innovation activities, especially in high-tech industries, tend to be spatially concentrated around metropolitan centres and specialised regional clusters, clusters are important for the economy's capacity to innovate [Kowalski, 2022]. According to [Karlsson, Andersson, 2009], the different industries have different propensities for spatial concentration of innovation activities, with the computer and pharmaceutical industries having a particularly high degree of concentration. It follows that the development of clusters of companies and other types of entities related to the pharmaceutical industry is of particular significance for innovation in this sector.

According to Porter's [1990] classic definition, clusters are "geographic concentrations of interconnected companies, specialised suppliers, service providers, companies in related sectors and associated institutions (for example, universities, standardisation bodies and industry associations) in particular fields, which compete but also cooperate". At the same time, the establishment of many formalised structures using the word 'cluster' in their names, as observed in many countries, prompts the definition of a related but not identical concept – the cluster initiative, which can be defined as "an organised effort aiming at intensifying growth and competitiveness of clusters in the region, which involves cluster companies, the government and/or research circles" [Sölvell, Lindqvist, Ketels, 2003].

The impact of clusters on the innovativeness of the economy is related to the fact that new technologies, especially in high-tech industries such as the pharmaceutical sector, are developed in entities that are in close proximity to each other. The proximity of companies and other entities, especially scientific ones, helps to foster interactions and linkages between partners, resulting in significant added value and a variety of synergies. Knowledge flow, technology transfer, learning and the development and uptake of innovations are supported by cooperation between the various cluster participants. The effectiveness of innovation processes in a regional economy depends on its innovation

capacity, in particular on soft factors such as quality human and social capital, including relational capital and trust, technological progress of scientific and research units, a business-friendly environment, and support from local authorities. These elements cannot be investigated independently, but must be treated as a single system, which is often achieved through the development of cluster structures [Kowalski, 2022].

The formation of clusters is an effective strategy for concentrating assets and resources to finance innovation activities, enabling a sufficient critical mass of private and public investment to be achieved. As clusters usually comprise universities and R&D units, knowledge production and other forms of inventive activities are more efficient. Compared to the possible costs of developing knowledge internally or sourcing it from entities located at a significant geographical distance, organisations can benefit from the lower costs associated with sourcing external information from regional partners. Clusters play a major role in the continuous transfer of information and technology from science to business, as they create lasting links between the two sectors. Personal connections are also important, especially when it comes to the transfer of 'tacit' knowledge, which requires direct contact [Karlsson, Andersson, 2009].

According to Statistics Poland [Statistics Poland, 2022b], there were 129 pharmaceutical manufacturers in Poland (counting entities with ten or more employees) accounting for PLN 16.854 billion of sold production, which accounted for only 0.8% of the global industry output. At the same time, the share of the domestic pharmaceutical industry in Polish GDP is declining and the sector is increasingly dependent on foreign supplies [Przybyłowski, Świerczyńska, Trębska, Gorzałkowski, 2020]. The Polish pharmaceutical sector accounts for 0.24% of the global market (2019 data), while China accounts for 27.8% of global pharmaceutical production, USA for 17.4% and Japan for 6.4%, while the shares of Switzerland, France, India, Germany and Italy vary between 3% and 5% [Polish Economic Institute, 2023]. The relatively low level of development of the pharmaceutical industry in Poland translates into poor cluster development in this area. In a study comprising 41 cluster initiatives, commissioned by the Polish Agency for Enterprise Development (PARP) and titled *Cluster Benchmarking in Poland – 2022 Edition* and designed to deepen knowledge on the condition and current state of development of clusters in Poland, only three initiatives related to healthcare and the pharmaceutical industry were identified: the NUTRIBIOMED Cluster, Lublin Medicine, and MedSilesia – the Silesian Network of Medical Devices. These clusters were considered to fall within the 'quality of life, tourism and recreation' area, comprising a total of eleven clusters. This area goes beyond the pharmaceutical and healthcare industry, but is well suited to the theme of well-being, which also falls within the scope of this report. The results obtained by clusters from this area compared to the results of clusters from the other five areas identified in the study are presented in Table 9.2.

Table 9.2. Benchmarking results obtained by cluster initiatives by area

Area	Cluster resources	Processes in the cluster	Cluster results	Cluster impact on the surroundings	Cluster internationalisation	Total
Quality of life, tourism and recreation	**0.23**	**0.34**	**0.23**	**0.25**	**0.18**	**0.24**
Chemistry, bioeconomy, materials science and power engineering	0.33	0.57	0.37	0.54	0.44	0.45
Metal production and processing	0.29	0.49	0.32	0.48	0.38	0.39
ICT	0.29	0.53	0.33	0.38	0.35	0.37
Automotive, aerospace production, transport	0.30	0.48	0.21	0.42	0.35	0.35
Construction	0.33	0.42	0.28	0.30	0.26	0.32
Total	**0.28**	**0.45**	**0.27**	**0.37**	**0.30**	**0.34**

Source: own elaboration based on PARP [2023] data.

Cluster initiatives in the area of 'quality of life, tourism and recreation' received low scores in the benchmarking study, ranking last overall as well as in the individual categories cluster resources, processes in the cluster, cluster impact on the surroundings, and cluster internationalisation. The only area in which this group was not the lowest performer was the 'cluster results' category, where it ranked penultimate. At the same time, the benchmarking study identified best practices, i.e., model solutions that enable achievement of outstanding effectiveness and efficiency in the implementation of activities and the attainment of development goals of cluster initiatives. One good practice is the creation by the cluster MedSilesia – the Silesian Network of Medical Devices of the Industry Competence Centre for MEDTECH, and within it the MedSilesia Competence Academy, which provides specialised training programmes. The training courses address issues such as verification of conformity of a medical device, the device release process, the creation and maintenance of technical documentation for the device, and post-marketing surveillance of the device. In addition, participants learn how to design, authorise, register, conduct and report on a clinical trial of a medical device, as part of the clinical evaluation required to assess the conformity of the device. The Industry Competence Centre is implemented through the COIN (Collaborative Innovation Network) platform created by the coordinator of the cluster initiative, which provides access to studies and training materials as well as to studies and training materials offered by regional R&D units and universities for the medical device industry. At the same time, value added is provided by the section on the internationalisation

of research activities, which is linked to the involvement of dozens of members of the cluster initiative in joint MedSilesia Go Global projects [PARP, 2023].

9.4. Innovation level of the Polish pharmaceutical industry in 2019–2021

A company's innovativeness is determined by its innovative capacity as well as the innovation position it has achieved. The innovative capacity of a company is the ability to create and apply/commercialise new ideas – innovative solutions. This is an input-based approach to innovation, one of the key measures of which is R&D expenditure.

The innovation position, in turn, is an output-based approach that shows the effects of innovation activity – the combination (in a specific economic and institutional environment) of a society's creativity and its financial resources [Weresa, 2012, p. 32].

Innovation activities undertaken by a company "include all developmental, financial and commercial activities intended to result in innovation. Some of these activities are innovative, while others are not new, but are necessary to implement innovation. Innovation activities also include research and development (R&D) activities that are not directly related to the creation of a specific innovation" [Statistics Poland, 2022a].

The activities of innovative pharmaceutical companies not only have a substantial economic dimension, but also influence the functioning of the entire healthcare system, secure Poland's medication supply, and provide patients with innovative methods and solutions in line with the latest medical standards [Infarma, 2022].

The pharmaceutical industry (defined in statistical nomenclature as manufacture of basic pharmaceutical products and pharmaceutical preparations, NACE 21) is one of the most innovative sectors of the Polish economy. It is categorised by Eurostat and Statistics Poland as 'high-technology' industries alongside the manufacture of computers, electronic and optical products (NACE 26) and the manufacture of air and spacecraft and related machinery (NACE 30.3) [Statistics Poland, 2022a].

In 2019–2021, the share of innovative pharmaceutical companies[1] in the total number of companies was 63.6%, above the average for high-tech industries. Almost 48% of the total number of companies in this industry marketed new or improved products,[2]

[1] A product and business process **innovation enterprise** is "an enterprise that in the period under review marketed at least one product or business process innovation (a new or improved product or a new or improved business process)" [Statistics Poland, 2022, p. 27].

[2] A **product innovation** is "marketing of a product or service that is new or improved in its characteristics or applications. This includes significant changes in terms of technical specifications, components and materials, integrated software, ease of use or other functional characteristics. A product innovation may result from the application of new knowledge or technology or new applications or combinations of existing knowledge and technology" [Statistics Poland, 2022, p. 39].

while 38.6% of companies implemented new or improved business processes[3] (Table 9.3). These shares are significantly higher compared to the group of high-tech entities. However, the sold production of the Polish pharmaceutical industry is dominated by generic products, i.e., substitutes for the original medicine that has been available on the market for a minimum of ten years [Factories, 2023]. It is estimated that up to 80% of the medicines that are used in Poland are generic [Poradnik Zdrowie, 2023]. This fact is reflected in the relatively low share of revenue on sales of new or improved products in the total sales revenue of the pharmaceutical industry [Kowalski, Lewandowska, Poznańska, 2022]. In 2019–2021, this share was only 6.4%, compared to 22% for the high-tech industry.

Table 9.3. Innovation activities of pharmaceutical companies compared to high-tech companies in 2019–2021 (%)

Specification	Share of innovative high-tech enterprises in the total number of high-tech enterprises	Share of innovative pharmaceutical industry enterprises in the total number of pharmaceutical industry enterprises
Innovative enterprises	53.2	63.6
Companies which implemented new or improved products	40.7	47.7
Companies which implemented new or improved business processes	42.5	54.5
Companies which implemented new or improved products and business processes	29.9	38.6
Revenue on sales of new or improved products in total sales	22.0	6.4

Source: own elaboration based on Statistics Poland [2021] data.

9.5. Analysis of innovativeness of enterprises of the Polish pharmaceutical industry in comparison to EU countries

The aim of this analysis, based on data from the harmonised Community Innovation Survey (CIS) questionnaire for 2016–2018 and 2018–2020, is to show how the innovativeness of the Polish pharmaceutical industry has evolved in comparison to industries from other EU countries.

[3] A **business process innovation** is "the introduction of new or improved business processes in an enterprise in one or more business functions that significantly change previously used business processes" [Statistics Poland, 2022, p. 39].

The method of surveying and classifying innovations used to develop the CIS questionnaire is based on the proposals in the latest edition of the Oslo Manual [2018], developed by OECD and Eurostat experts. The CIS survey is performed periodically and the questionnaire used for the survey is harmonised to allow international comparisons.

In the CIS 11 edition (2016–2018), a total of 729 301 companies from 27 EU countries, belonging to NACE sections A–N, were surveyed, of which 366 758 (i.e., half) declared that they had introduced a product innovation or a business process innovation in their company between 2016 and 2018 (qualified as innovation-active companies).

In turn, in the CIS 12 edition (2018–2020), a total of 732 116 companies were surveyed, of which 52.7% (385 852) were innovation-active.

In Poland, a total of 62 048 companies were surveyed between 2016 and 2018, of which 14 675 (24%) declared that they had introduced a product or business innovation.

In the next edition, 2018–2020, 63 481 Polish companies were surveyed, of which 22 155 (35%) were innovation-active.

In Poland's C21 industry, 125 entities were surveyed for the 2016–2018 period, of which 73 (58%) declared that they had introduced a product or business innovation.

For the period 2018–2020, in turn, 115 entities were surveyed in Poland's C21 industry, of which 73 (63%) declared that they had introduced a product or business innovation.

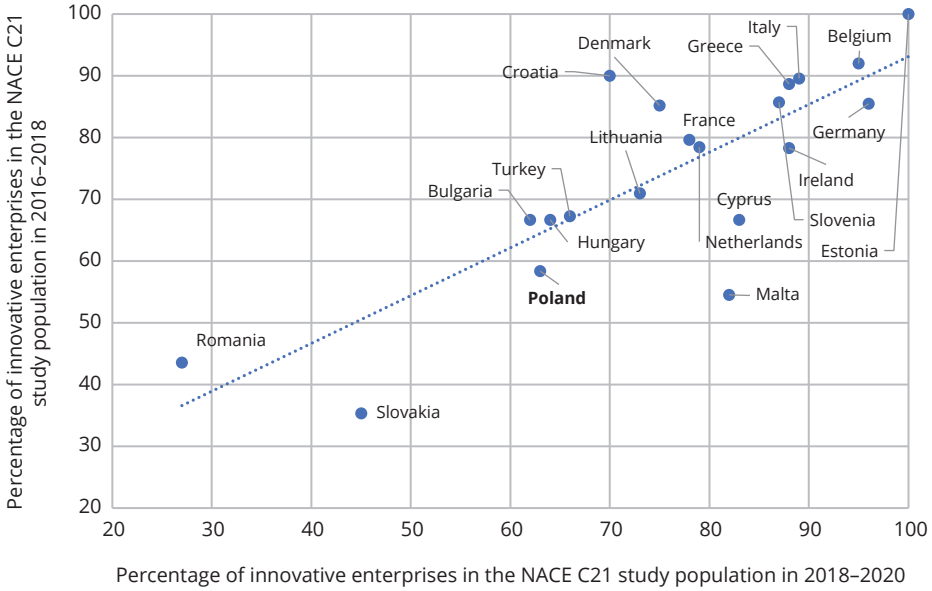
Figure 9.4 presents a summary of data for innovation-active pharmaceutical companies for the 2016–2018 and 2018–2020 periods. The figure shows that entities from Estonia, Belgium and Germany have the strongest and most sustained innovation activities. In contrast, pharmaceutical companies from Romania and Slovakia are the weakest performers in this regard.

Although they have improved slightly, the innovation activities of entities from Poland are at a relatively low level in comparison with entities from the 'old' European countries.

In the analysis of the innovation activities of companies in the pharmaceutical sector of the EU countries that have introduced a product and/or business process innovation or have engaged in innovation activities that were interrupted, abandoned or not completed, two factors will be taken into account: expenditure on innovation (innovation budget),[4] and revenue on sales of new or significantly improved products.

[4] **Financial expenditure on product and business process innovation activities** is current and capital expenditure on product and business process innovation that was incurred during the reporting year for work that was successfully completed (i.e., implementation of the innovation), not completed (continued) and interrupted or abandoned before completion, regardless of the source of funding. This includes research and development (R&D); in-house innovation staff (gross salaries and salary mark-ups); materials and third-party services purchased to carry out innovation activities; investment in fixed assets;

Figure 9.4. Share of innovative enterprises in the NACE C21 (pharmaceutical industry) study population in selected European countries in 2016–2018 and 2018–2020 (%)



Source: own elaboration based on Eurostat (CIS 2016–2018 and CIS 2018–2020) data.

Data for pharmaceutical companies (C21 – manufacture of basic pharmaceutical products and pharmaceutical preparations) is incomplete, so in further discussion the analysis will focus on seventeen countries, including Poland.

It also needs to be pointed out here that the method adopted for averaging innovation expenditure and revenue on sales of innovative products does not take into account the size of enterprises, their product specialisation, and other variables.

To calculate the innovation budget per company, the innovation budget declared for the entire industry was divided by the number of innovative companies surveyed.

In turn, to calculate revenue on sales of new or significantly improved products per company, revenue on sales of new or significantly improved products declared for the entire industry was divided by the number of innovative companies surveyed.

Innovation budgets and sales levels of innovative products determine the position of the circles representing the pharmaceutical industries from the countries surveyed. The size of the circles illustrates the size of the surveyed population of innovative

other expenditure incurred to introduce new or improved products or business processes [Statistics Poland, 2021, p. 58].

enterprises (i.e., the number of such entities that declared that they had introduced a product innovation and/or a business process innovation or engaged in interrupted, abandoned or not completed innovation activities).

It is evident from the data in Figure 9.5 that the average declared innovation budget is highest in pharmaceutical companies from Denmark and Belgium. In contrast, the lowest average innovation budgets were declared by entities from Romania, Malta, and Slovakia.

The leaders in declared cooperation in innovation are pharmaceutical companies from Estonia (100% made this declaration), Belgium and Finland. Again, the weakest performers in this respect are entities from Malta and Slovakia.

When considering the average innovation budget, Polish pharmaceutical companies rank among countries such as Romania and Estonia.

In turn, in terms of the level of revenue on sales of innovative products, Belgium, Denmark, and Ireland are at the top of the list.

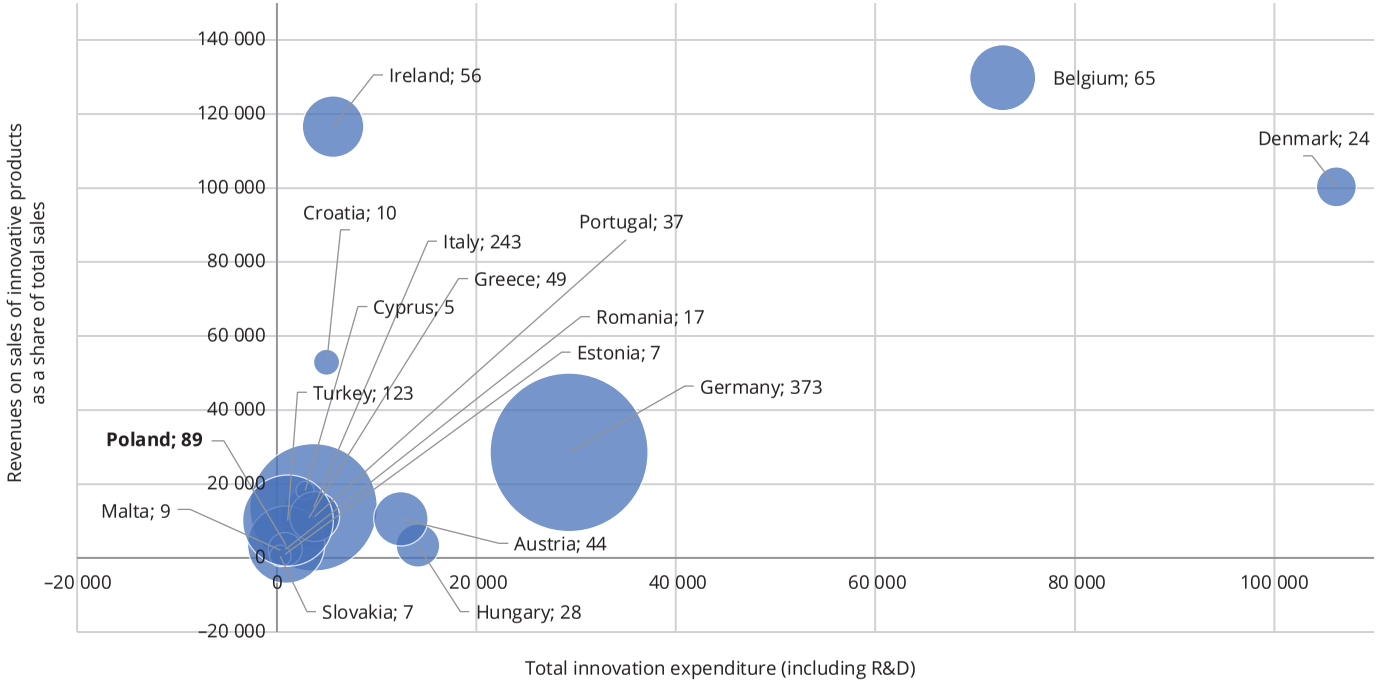
A comparison of Polish pharmaceutical companies to the innovation expenditure leader, i.e., Denmark, shows that the average declared budget of a Polish company in the industry is just over 1% of the average budget of a Danish company.

A comparison of Polish pharmaceutical enterprises to the leader in sales of innovative products per enterprise, i.e., Belgium, shows that the average declared revenue of a Polish pharmaceutical enterprise on sales of innovative products is 3% of the sales level of a Belgian enterprise.

This indicates unequivocally that in terms of these two very important variables, Poland is still behind the leaders, although the position of the Polish pharmaceutical industry compared to all EU countries, including those from Central and Eastern Europe, is stable and is a good starting point for a gradual increase in its level of innovation.

A detailed breakdown of the data for the seventeen countries is presented in Table 9.4.

Figure 9.5. Declared level of innovation expenditure (innovation budget, EUR thousands) and declared level of sales of new products (EUR thousands) of companies in the pharmaceutical industry (NACE C21) in selected European countries in 2018–2020



Notes: the bubble size is the size of surveyed sample of pharmaceutical companies in a given country.

Source: own elaboration based on Eurostat (CIS 2016–2018 and CIS 2018–2020) data.

Table 9.4. Summary of innovation expenditure (including R&D) and revenue on sales of innovative products as a share of total sales for companies in selected European in 2018–2020

Country	Number of pharmaceutical entities surveyed	Total innovation expenditure (including R&D, EUR thousands)	Revenues on sales of innovative products as a share of total sales (EUR thousands)	Innovation expenditure per company per industry (EUR thousands)	Revenues on sales of innovative products per company (EUR thousands)	Ratio of innovation expenditure to revenue generated on innovative products (%)	Share of the industry in total expenditure (%)	Share of the industry in total sales of innovative products (%)
Belgium	65	4 730 231	8 440 803	72 773	129 859	56	22.55	24.03
Denmark	24	2 548 944	2 408 565	106 206	100 357	106	12.15	6.86
Germany	373	10 932 908	10 654 787	29 311	28 565	103	52.11	30.33
Estonia	7	5813	7060	830	1009	82	0.03	0.02
Ireland	56	316 846	6 528 456	5658	116 580	5	1.51	18.58
Greece	49	157 639	529 686	3217	10 810	30	0.75	1.51
Croatia	10	50 068	529 432	5007	52 943	9	0.24	1.51
Italy	243	898 736	3 338 667	3699	13 739	27	4.28	9.50
Cyprus	5	14 180	91 309	2836	18 262	16	0.07	0.26
Hungary	28	396 045	94 490	14 144	3375	419	1.89	0.27
Malta	9	3387	19 338	376	2149	18	0.02	0.06
Austria	44	547 897	464 563	12 452	10 558	118	2.61	1.32
Poland	**89**	**82 738**	**320 240**	**930**	**3598**	**26**	**0.39**	**0.91**
Portugal	37	139 953	412 914	3783	11 160	34	0.67	1.18
Romania	17	14 504	39 850	853	2344	36	0.07	0.11
Slovakia	7	2396	3921	342	560	61	0.01	0.01
Turkey	123	137 413	1 244 133	1117	10 115	11	0.65	3.54
	1186 (total)	20 979 698 (total)	35 128 214 (total)	17 689 (average)	29 619 (average)	60 (average)		

Notes: the summary includes data from countries for which complete data was available.

Source: own elaboration based on Eurostat (CIS 2018–2020) data for the pharmaceutical industry.

9.6. Conclusions

The analysis of the innovativeness of the Polish health innovation system leads to the following conclusions:

- innovation in the broad field of public health is described in the literature using the emerging concept of a national health innovation system (NHIS),

- an NHIS is most often defined with reference to the concept of a national innovation system as the interactions between the research and innovation activities of entities in the medical industries and those involved in healthcare delivery and the institutions and standards in the national innovation system, especially those related to public health and healthcare,
- compared to the OECD countries, Poland's NHIS is relatively underdeveloped; among the CEE countries, Hungary and Slovakia rank similar in this respect,
- the period 2015–2021 saw some improvement in Poland's health innovation indicators; there was an increase in R&D in medical sciences, and on the output side there was an improvement in patent rates and, as a result, from 2019 onwards, Poland had a relative technological advantage in medical technologies.

Observations on the concentration of innovation activities and the importance of clusters in high-tech industries, which include the pharmaceutical industry, and an analysis of the development of clusters related to the areas of medicine, pharmacy and quality of life in Poland lead to the following conclusions:

- a high level of concentration of high-tech industries in clusters is observed, with a particularly high degree of concentration of the pharmaceutical industry; this fosters a concentration of assets and resources to finance innovation activities, and has an impact on knowledge commercialisation and technology transfer,
- pharmaceutical manufacturers account for only 0.8% of Poland's global industry output, and the Polish pharmaceutical sector accounts for 0.24% of the global market,
- the relatively low level of development of the pharmaceutical industry in Poland translates into poor cluster development in this area,
- in a PARP benchmarking study covering 41 cluster initiatives, only three initiatives related to healthcare and the pharmaceutical industry were identified, included in a broader group of eleven clusters in the 'quality of life, tourism and recreation' area, which received low scores in the benchmarking study compared to other industry areas.

The final aim of the study was to assess the level of innovativeness of entities in the Polish pharmaceutical industry in comparison with industries in other European Union countries:

- the analysis, with Statistics Poland data for 2019–2021 as the main source of data, shows that the Polish pharmaceutical industry is Poland's leader in terms of the share of innovative companies in overall industry,
- the Polish pharmaceutical industry also features a relatively low share of revenue on sales of new or improved products in total revenue, which is due to the fact that the majority of sales is generic products, i.e., substitutes for the original medicine,

- when viewed in relation to those from the European Union, referring to data from the 2018–2020 Community Innovation Survey, the position of Polish pharmaceutical industry entities, taking into account the average declared innovation budget, is quite average and places them among entities from countries such as Romania, Estonia, and Turkey; Polish pharmaceutical companies are a long way behind those from Denmark and Belgium in terms of innovation expenditure,
- if we consider the innovation budgets of entities from all seventeen European countries surveyed, the share of Polish industry's budget is only 0.39% (with 89 entities from Poland out of 1186 surveyed from seventeen countries),
- revenue on sales of innovative products earned by Polish enterprises in relation to the revenue generated by entities from all seventeen countries surveyed accounts for less than 1% (with 89 entities from Poland out of 1186 surveyed from seventeen countries).

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Chapter 10

Digital Transformation of Healthcare in Poland – Selected Legal Aspects

Łukasz Dawid Dąbrowski

10.1. Introduction

The development of telecommunications networks, the Internet and ICT has accelerated the digital transformation of healthcare in Poland [Wrześniewska-Wal, Hajdukiewicz, 2020, p. 510]. In some way, however, the COVID-19 pandemic period forced patients to use remote medical services. Also, this period provided an indication for the legislature of the direction of the necessary changes in terms of e-health medical and paramedical services. During the COVID-19 pandemic, as much as 82% of primary healthcare services were provided via the Internet, and 92% of those who used them confirmed that they had received the expected assistance [ICT Market Experts, 2021]. In 2021, 79.8% of Poles used telemedicine services. Telemedicine in the broadest sense was used more often by women (83.7%) than men (75.5%). This form of contact with doctors was used more frequently by people with higher education (84.9%) than by other social groups. In contrast, the age of patients was not a barrier – those aged sixty and over tended to use telemedicine services as frequently as younger patients [Biostat, 2022, p. 1]. Patients used e-health services in the form of telephone registration (52.6%), online prescriptions (51.4%), remote medical consultations (47.6%), and remote medical examination services, in the form of sending photos or videos to the doctor, and remote monitoring of health [Biostat, 2022, p. 7]. Telemedicine is the future of modern medicine. From 2021 onwards, there was a steady increase in interest in e-health services, the development of which is coupled with the scope and pace of the digital transformation and the development of regulations that must be adapted to the evolving reality.

The aim of the chapter is to investigate using methods employed in legal practice, the systemic and legal possibilities for providing, as well as improving, telemedicine services, including their alignment with current telemedicine standards. The study provides a synthetic overview of the basic concepts used in the context of the digitalisation

of healthcare, the scope of services that constitute telemedicine in Poland along with the legal basis for their provision, the premises of the EU health programme, and measures taken in the infrastructural area which has a direct impact on the scope and quality of telemedicine services provided. The main risks involved in the digital transformation of healthcare have also been identified.

The study argues that regulations are evolving to enable the ever-increasing provision of services in an ICT system, and that the infrastructural measures taken will accelerate the digital transformation of healthcare by expanding the scope of telemedicine services and improving the quality of these services, and this will allow greater professionalisation of activities. The primary method used in the analysis presented in this chapter is the formal-dogmatic method. This method was mainly used to present the legal basis for the provision of telemedicine services.

10.2. Scope of the terms 'digital transformation', 'e-health' and 'telemedicine'

Digital transformation of healthcare involves the introduction and application of digital technology-based solutions in all activities concerning the delivery of medical and paramedical services. Digital transformation requires broadband infrastructure for high-speed internet access, and IT solutions that will increase the range of medical and paramedical services available electronically. Digital transformation of healthcare is embodied in specific medical services generally classified as e-health or telemedicine services. These terms are substantially pleonastic, as there is a surfeit of terms with the same or almost the same meaning. It is not easy to find the right terminological proportions and to establish the conceptual ('sharp') scope of these terms in view of the large selection of synonyms or near synonyms, which are used quite arbitrarily not only in colloquial speech, but also in literature on the subject. This study is not concerned with systematising these definitions, and for this reason the definitions cited are the most common ones. One of these is the definition used by the World Health Organisation, which describes 'telemedicine' as "[t]he delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities" [WHO, 2010, p. 8]. In turn, according to an EU Commission Communication, "[t]elemedicine is the provision of healthcare services, through use of ICT, in situations where the

health professional and the patient (or two health professionals) are not in the same location. It involves secure transmission of medical data and information (as text, sound, images or in other forms) needed for the prevention, diagnosis, treatment and follow-up of patients" [COM/2008/689 final]. The American Telemedicine Association's (ATA) definition of telemedicine is also often quoted, which defines telemedicine as "the exchange of medical information between two or more users using electronic communication to improve patients' health" [Wrześniewska-Wal, Hajdukiewicz, 2020, p. 512]. These definitions are very broad, allowing the term 'telemedicine' to cover a wide spectrum of remote medical services. The services that fall under telemedicine are described (termed) in various ways both in literature and in everyday use. In journalistic terms, telemedicine includes teleconsultation,[1] telediagnosis,[2] telecare,[3] telemedical assistance,[4] and telesurgical procedures,[5] (telesurgery) [Maziarz, 2010, p. 34]. However, in both theory and practice, teleconsultation must be distinguished from telediagnosis or telecare, and these, in turn, from telesurgery. Therefore, the collective term 'e-health' [Wrześniewska-Wal, Hajdukiewicz, 2020, p. 511.] is sometimes used in literature. All of the above 'tele-' services (concepts) fall under the term 'e-health'. In contrast, not all services provided remotely (e.g., tele-registration) are included in telemedicine. A similar situation exists in the case of the Internet Patient Account,[6] which is part of the digital transformation of healthcare, while not being provision of medical services. In the study, it was decided to use the term 'telemedicine' mainly because of its prevalence in scientific and journalistic writing, but also because it is commonly coined in society.

1 Remote medical appointments using not only audio but also video (image), during which it is possible to discuss the specific medical case. During such a visit, it is possible to select and magnify a specific part of the image thanks to the interactive links of the medical apparatus (electrocardiogram, stethoscope).

2 Transmission of examination results from the medical apparatus, conducting an interactive specialist medical examination.

3 This makes it possible to ensure the safety of the subjects (not necessarily the patients), and this includes by monitoring the person's functioning, as well as enabling them to receive timely and appropriate assistance (sometimes also medical assistance). Special monitoring wristbands make it possible to keep track of vital signs (blood pressure, pulse, glucose level), as well as to react to sudden changes in body position (signalling falls) or, finally, to call for help intentionally (the 'life button').

4 Providing physical therapy using interactive video, changing a dressing, flushing a catheter – following the instructions of the doctor, physical therapist, nurse.

5 Performing surgical procedures using the latest developments in telecommunications and robotics.

6 The Internet Patient Account can be used for instance to order and receive an e-prescription or an e-referral, check information on e-sick leave and medical certificates issued in connection with sickness and maternity, select or change a GP, primary healthcare nurse or midwife, and check one's treatment history through access to electronic medical records, including examination reports, diagnostics, laboratory results with descriptions or hospital discharges.

10.3. Legal background to telemedicine and telemedicine services

It is widely accepted in literature that Polish legislation does not contain a legal definition of telemedicine [Nowak, 2018, pp. 36–45]. This is only true in terms of the classical definitions provided by the WHO, EC or ATA. There is no definition of telemedicine in health laws in the form of the glossary/definitions which are increasingly common in national legislation, but such a definition can easily be derived from two provisions in the Act of 15 April 2011 on Therapeutic Activity [Journal of Laws 2011, no. 112, item 654 as amended]. According to Article 3(1) of that act, "therapeutic activity is the provision of health services. These services may be provided via ICT[7] or communication systems". In turn, according to Article 2(1)(10) of the act, "a health service is an activity aimed at preserving, saving, restoring or improving health, as well as other medical activities resulting from the process of treatment or from separate regulations governing their performance". Furthermore, according to Article 3(3) of that act, promotion of health, or performing teaching and research tasks in connection with the provision of health services and health promotion, including the implementation of new medical technologies and treatment methods, may also be therapeutic activity. The act specifies that this additional activity can be carried out via ICT or communication systems [Article 3(2a) Journal of Laws 2011, no. 112, item 654 as amended]. On the basis of the above regulations, according to Polish legislation, the concept of 'telemedicine' can be considered in three approaches – from the narrowest to the broadest. Telemedicine *sensu stricto* is a health service provided via telecommunications networks to preserve, save, restore or improve health. Telemedicine *sensu largo* also includes other medical activities resulting from the process of treatment or from separate regulations governing their performance. Telemedicine *sensu largissimo*, in turn, also includes activities involving health promotion, or performing teaching and research tasks in connection with the provision of health services and health promotion, including the implementation of new medical technologies and treatment methods.

As it became possible to provide telemedicine services under this act, the appropriate legal norms had to be adopted in laws regulating the provision of medical services by medical professionals – physicians, dentists and nurses.

[7] An ICT system is a set of compatible IT devices and software ensuring processing, storing, and sending and receiving data via telecommunication networks by means of a telecommunications terminal device suitable for a given type of network within the meaning of the provisions of the Telecommunications Law of 16 July 2004 [Journal of Laws 2022, items 1648 and 1933].

Pursuant to Article 2(1) of the Act of 5 December 1996 on the Professions of Physician and Dentist [Journal of Laws 1997, no. 28, item 152 as amended], practising the profession of a physician consists in a person holding the required qualifications, confirmed by relevant documents, providing health services, in particular: examining state of health, diagnosing and preventing diseases, treating and rehabilitating patients, providing medical consultations, and issuing medical opinions and judgments. In turn, practising the profession of a dentist consists in a person holding the required qualifications, confirmed by relevant documents, providing the above-mentioned services in the field of diseases of the teeth, oral cavity, craniofacial part and adjacent areas. According to this act, a physician or a dentist may also perform the above-mentioned treatment activities via ICT or communication systems. At the same time, under Article 9 of the Code of Medical Ethics, a physician may only undertake treatment after examining a patient, except where medical consultation can only be provided remotely [Naczelna Izba Lekarska, 2003]. Thus, the Code of Ethics prohibits treatment without prior examination of the patient, and the only exception is cases in which emergency medical treatment in the form of a consultation can only be provided remotely (e.g., the doctor finds out about the accident by telephone). On the one hand, the Code of Ethics is not a universally applicable law, and therefore it should not be binding on doctors in an absolute manner. On the other hand, according to Article 53 of the Act of 2 December 2009 on Medical Chambers [Journal of Laws 2009, no. 219, item 1708 as amended], members of medical chambers are subject to professional liability for violations of medical ethics and the regulations related to practising the profession of a physician. By virtue of this regulation, the norms of the Code of Ethics have been incorporated into the current legal system. Thus, the standards of the Code of Ethics are binding on doctors [Wrześniewska-Wal, Hajdukiewicz, 2020, p. 517]. It is therefore advocated that the Code of Ethics be amended so that the regulations keep pace with modern requirements.

The possibility of providing telemedicine services is also provided for in Article 11(1) of the Act of 15 July 2011 on the Professions of Nurse and Midwife [Journal of Laws 2011, no. 174, item 1039 as amended]. According to this law, a nurse or midwife are required to practise their profession with due diligence, in accordance with the principles of professional ethics, respecting the rights of the patient and ensuring their safety, in accordance with current medical knowledge, and via ICT or communication systems.

Also envisaged is the possibility to provide certain pharmaceutical services by means of ICT. Pursuant to Article 4(3) (3) and (4) in conjunction with section 6 of the Act of 10 December 2020 on the Profession of Pharmacist [Journal of Laws 2021, item 97 as amended], a pharmacist may use ICT systems or means of electronic communication to conduct a pharmaceutical interview and provide pharmaceutical

consultation to ensure the correct use of a medicinal product, medical device or foodstuff intended for a particular nutritional use, in particular with regard to the dispensing of the appropriate OTC medicinal product, and the provision of information on the correct administration, including dosage and possible interactions with other medicinal products or food, of the dispensed product, device or foodstuff and the correct use of medical devices.

The Act of 9 October 2015 amending the Act on the Healthcare Information System and certain other acts [Journal of Laws 2015, item 1991] allows a medical visit to be conducted by means of ICT. The use of teleconsultations was allowed in September 2019, but in practice, teleconsultations came into use from March 2020, i.e., after the COVID-19 epidemic state was declared [Olczyk, 2022]. On the other hand, the organisational standards for teleconsultation provided in primary healthcare are set out in the Ordinance of the Minister of Health of 12 August 2020 on the Organisational Standard of Teleportation in Primary Healthcare [Journal of Laws 2022, item 1194].

The obligations of persons authorised to issue prescriptions for medicines, foodstuffs intended for a particular nutritional use and medical devices are stipulated in the Act of 12 May 2011 on Reimbursement for Medicines, Foodstuffs intended for a Particular Nutritional Use and Medical Devices [Journal of Laws 2020, item 357 as amended]. Persons referred to in Article 2(14) of this act are entitled to issue e-prescriptions in the same way as paper prescriptions, and these persons are pharmacists, physicians, dentists, nurses, midwives as well as advanced practitioners and senior advanced practitioners. E-prescriptions became effective as of 1 January 2019. For one year, they were used in parallel with paper prescriptions, and from 8 January 2020, prescriptions could only be issued in electronic form. An e-prescription can be accessed via a text message or e-mail, and is also available on the Internet Patient Account. A cross-border e-prescription was also introduced as an aid for purchasing medicine in any EU country, as well as in the EFTA countries (Iceland, Liechtenstein and Norway). A cross-border e-prescription is the term for any electronic prescription that can be used in an EU country other than the one in which it was issued. Polish citizens can purchase cross-border e-prescription medicines in Croatia, Finland, Estonia, the Czech Republic, Portugal and Spain (applies to pharmacies in Madrid, the Canary Islands, the Basque Country, Catalonia, Extremadura, Aragon, Valencia, Cantabria, Castile and León, Castilla-La Mancha and Andalusia), while citizens of Portugal, Estonia, Finland, Czechia, Croatia and Spain can purchase their cross-border e-prescription in Poland. It will be gradually introduced by the remaining countries [Serwis Ministerstwa Zdrowia i Narodowego Funduszu Zdrowia, 2023b].

Under amendments [Journal of Laws 2018, item 1128 and 1925] to the Act of 25 June 1999 on Monetary Benefits from Social Security for Sickness and Maternity

[Journal of Laws 2017, item 1368 as amended], as of 1 January 2016, doctors can issue electronic medical certificates, known as 'e-ZLA'. Medical certificates could be issued as hard copies until the end of November 2018. As of 1 December 2018, doctors could only issue electronic medical certificates [ZUS, 2023]. Once completed, the electronic medical certificate is automatically sent to and registered in the Social Insurance Institution system. If a patient sets up an account on the Electronic Services Platform of the Social Insurance Institution, they can also have access to an issued medical certificate [Dereń, 2019].

In turn, as of 8 January 2021, medical establishments are required to issue and process electronic referrals [Serwis Ministerstwa Zdrowia i Narodowego Funduszu Zdrowia, 2023a]. The Ordinance of the Minister of Health of 15 April 2019 on Referrals Issued Electronically in the Medical Information System [Journal of Laws 2022, item 1304] specifies the list of healthcare services for which referrals are issued electronically. It stipulates that an e-referral can be issued for:

1) outpatient specialist services, with the exception of speech therapy consultations,
2) hospital treatment,
3) nuclear medicine examinations and CT scans, in this case also those financed by means other than National Health Fund insurance,
4) magnetic resonance imaging,
5) gastrointestinal endoscopy,
6) foetal echocardiography,
7) rehabilitation.

However, according to the communication of the Minister of Health of 23 June 2023 on the Issuing, Verification and Execution of Supply Orders and Repair Orders issued in Electronic Form [Ministry of Health, 2023], from 1 July to 30 September 2023, issuing e-orders was optional; as of 1 October 2023, issuing e-orders signed electronically is mandatory. This means that as of 1 October 2023, persons issuing medical device supply orders are required to sign the order using one of the forms specified in Article 38 (4d) of the Reimbursement Act [Journal of Laws 2020, item 357 as amended]: a qualified electronic signature, a trusted signature, a personal signature, or a method of confirming the origin and integrity of data available in the ICT system made available free of charge by the Social Insurance Institution or the National Health Fund.

Telemedicine is strongly associated with the accessibility of electronic medical records. These issues are regulated by the Ordinance of the Minister of Health of 6 April 2020 on Types, Scope and Models of Medical Records and the Way they are Processed [Journal of Laws 2022, item 1304]. Under these regulations, the electronic form is considered the primary form of record keeping. The Act of 28 April 2011 on the

Healthcare Information System [Journal of Laws 2011, no. 113, item 657 as amended] in conjunction with the Act of 17 February 2005 on the Computerisation of the Activities of Entities Performing Public Tasks [Journal of Laws 2005, no. 64, item 565 as amended] define the organisation and principles of operation of the healthcare information system in which the data necessary for the state's health policy, the improvement of the quality and availability of healthcare services, and the financing of healthcare tasks is processed. These acts address issues such as establishing minimum requirements for ICT systems used for performing public tasks and for public registers, and the electronic exchange of information with public entities.

Notwithstanding the above, in October 2022, the Ministry of Health introduced the eHealth Development Programme for 2022–2027, aimed at improving healthcare through digitalisation. E-health mainly involves the development of remote care in the patient's environment and self-diagnosis. The aim of the Programme is to make better use of data and to use artificial intelligence for purposes such as 'suggesting' to medical professionals what they should pay particular attention to when diagnosing a particular patient, through the development of clinical decision support tools and improved diagnostic performance. The Programme is to be implemented in three phases. In the first, e-services will be implemented nationwide; in the second, solutions to support coordinated patient care will take effect. The third phase involves the extensive use of solutions related to clinical decision support and telemedicine [Ministry of Health, 2022].

10.4. EU health programme

European Union legislation creates favourable conditions for the development of telemedicine. The EU4Health programme was adopted as a response to the COVID-19 pandemic and to reinforce crisis preparedness in the EU [European Commission, 2021]. The programme sets minimum standards for the qualification of a healthcare provider or pharmaceutical service provider [Kaczan, 2017, p. 102]. The EU4Health Programme has a budget of approximately EUR 2.5 billion for the period 2021–2027. Thus, the possibility of obtaining EU funds is a unique opportunity for the development of telemedicine, as telemedicine is one of the priorities related to the development of society, including the information society, in the European Union [Maziarz, 2010, p. 40].

Regulation (EU) 2021/522 of the European Parliament and of the Council of 24 March 2021 establishing a Programme for the Union's action in the field of health for the period 2021–2027, and repealing Regulation (EU) No 282/2014 [Official Journal of the EU 2021, L 107] brings the EU added value and complements member states'

policies in pursuing the four general objectives corresponding to the programme's objectives and the ten specific objectives in the individual areas of intervention. The general objectives are [Article 3(d)(v) of the Official Journal of the EU 2021, L 107]:

1) to improve and foster health,
2) to protect people,
3) to provide access to medicinal products, medical devices and crisis-relevant products,
4) to strengthen healthcare systems through measures such as reinforcing health data, digital tools and services, and digital transformation of healthcare.

In turn, the specific objectives include strengthening the use and re-use of health data for the provision of healthcare and for research and innovation, promoting the use of digital tools and services, and the digital transformation of healthcare systems, including by supporting the creation of a European health data space [Article 4(f) of the Official Journal of the EU 2021, L 107]. The EU4Health Programme is implemented through annual work programmes. Under Article 12 ("Eligible actions"), only actions that implement the objectives set out in the Regulation, in particular the actions set out in Annex I, shall be eligible for funding, and these include:

1) supporting the deployment, operation and maintenance of mature, secure and interoperable digital service infrastructure and data quality assurance processes for the exchange of, access to, and use and reuse of, data; supporting cross-border networking, including through the use and interoperability of electronic health records, registries and other databases; developing appropriate governance structures and interoperable health information systems,
2) supporting the optimal use of telemedicine and telehealth, including through satellite communication for remote areas, fostering digitally-driven organisational innovation in healthcare facilities and promoting digital tools to support citizen empowerment and patient-centred care,
3) supporting the development, operation and maintenance of databases and digital tools and their interoperability, including already established projects, where appropriate, with other sensing technologies, such as space-based technologies and artificial intelligence,
4) supporting the deployment and interoperability of digital tools and infrastructure within and between member states and with Union institutions, agencies and bodies,
5) actions to support e-health, such as the transition to telemedicine and at-home administration of medication,
6) supporting the establishment of interoperable electronic health records, in line with the European Electronic Health Record Exchange format in order to increase the use of e-health and improve the sustainability and resilience of healthcare systems.

The Programme may provide funding in any of the forms laid down in the Financial Regulation, in particular in the form of grants, prizes and procurement [Article 7(2) of the Official Journal of the EU 2021, L 107]. Where a contribution has been made for an action under the Programme, a contribution may be made for that action under any other Union programme, including funds under shared management, provided that the contributions do not cover the same costs [Article 11(1) of the Official Journal of the EU 2021, L 107]. This is an important rule because health-related issues are cross-cutting. The EU4Health Programme cooperates with other EU programmes, policies, instruments and measures, including: Digital Europe [EU4Digital, 2023] and Connecting Europe [INEA, 2023] – to build the digital infrastructure needed for digital healthcare tools. Funding opportunities under the EU4Health Programme are announced by the Health and Digital Executive Agency (HaDEA) [European Health and Digital Executive Agency, 2023].

The COVID-19 crisis highlighted the importance of digital transformation in the health and care sector. Digitisation can increase the resilience of healthcare systems and their efficiency, and strengthen the overall response to possible pandemic threats in the future. The European Commission has included e-health as one of the key sectors in its digital transformation programme. On 3 May 2022, the European Commission proposed a regulation to create a European Health Data Space (EHDS) [COM/2022/197 final]. This act would:

1) ensure that patients have full control over their health data, which would be published in a uniform manner at European level,
2) support the use of health data for better healthcare delivery and better research and innovation by providing a regulatory framework for cross-border access to data for researchers to facilitate medical research [European Council, Council of the EU, 2023],
3) enable the EU to make full use of the potential offered by safe and secure exchange, use and reuse of health data [European Commission, 2023].

10.5. Development of IT infrastructure and technologies

Digital transformation of health is conditional on the continued cooperation and mutual complementarity of three disciplines: medicine, telecommunications (ICT) and new technologies [Olszanowski, Gierek, Skrzypek, 2016, p. 19]. The tools for practising telemedicine safely and effectively are new technological solutions, such as instant messaging, mobile applications, and network-connected sensors. Without the appropriate telecommunications infrastructure, hardware and software, interoperable

IT systems, and the competence of their users, the potential of telemedicine will not be fully tapped [Telemedyczna Grupa Robocza, 2018, p. 53]. Poland is at a point where IT solutions already available and widely used in other countries have not yet been fully implemented in healthcare [Telemedyczna Grupa Robocza, 2018, p. 42]. One of the reasons for this is that the development of 5G telecommunications networks and the associated development of the necessary (core) telecommunications infrastructure covering principal areas of Poland, as well as with a certain bandwidth and maximum data latency, are still in progress.

Digital transformation of health will be possible once the obligations are fulfilled arising from the auction commitments for the reservation of four 3.6 GHz band frequencies, enabling the development of 5G networks. The auction has been awaited since 2020, when an auction scheduled for 13 June 2020 was cancelled by the President of the Office of Electronic Communications. One of the reasons for delaying the auction was the prolonged work on the amendment of the Cybersecurity Act, the provisions of which were to be used in the planned auction. The act has been amended several times [Sejm RP, 2023]. Ultimately, the act was not amended. Incidentally, to date Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code has not been implemented into Polish law [Official Journal of the EU 2018, L 321].

The auction started on 22 June 2023 [UKE, 2023a] and ended on 18 October 2023 [UKE, 2023b]. The four operators selected in the auction are required to deploy, within 48 months from the date of delivery of the reservation, at least 3800 base stations in the reservation area, including at least:

1) 400 base stations in municipalities with a population of between 10–20 thousand,
2) 700 base stations in municipalities with a population of between 20–50 thousand,
3) 300 base stations in municipalities with a population of between 50–80 thousand.

Operators have an obligation to provide data service coverage to households in the reservation area, with the required bandwidth and maximum latencies specified in the schedule, within the following time limits:

4) 12 months – coverage of 95% of households in the reservation area with a 30 Mbps bandwidth,
5) 36 months – coverage of 98% of households in the reservation area with a 50 Mbps bandwidth,
6) 60 months – coverage of 99% of households in the reservation area with a 95 Mbps bandwidth, with a maximum latency of 10 ms.

In addition, they have an obligation to provide data service coverage to national roads, railways and border crossings referred to in the auction documentation, with the required bandwidth and maximum latencies specified in the auction schedule.

The development of telecommunications infrastructure is also supported by European and national funding. The European funds for 2021–2027 covering the period up to 2030 are EUR 72.2 billion from the Cohesion Policy and EUR 3.8 billion from the Just Transition Fund. The funds are intended to be allocated for investment in innovation, entrepreneurship, environmental protection, power industry, education and social affairs, as well as in digitalisation and infrastructure, i.e., in the development of telecommunications services. Major telecommunications development funding programmes include: the Operational Programme Digital Poland (OPDP), which has already been completed, the European Funds for Digital Development (EFDD) programme, which is a continuation of the OPDP and is the next stage of the digital transformation with a budget of around EUR 2 billion, and the National Recovery Plan. The assumed objectives of the programmes include financing of the construction of telecommunications infrastructure (high-speed internet), the development of public e-services, ensuring cybersecurity, the development of a data-based economy, and the advancement of digital technologies.[8]

The availability of a radio spectrum in the appropriate ranges and significant financial investments in the expansion and modernisation of telecommunications infrastructure are indispensable prerequisites for launching services based on 5G technologies or access to high-speed fibre-optic internet. Thanks to the 5G network, data transmission will be faster,[9] network capacity will increase,[10] and latency (response time of the 5G network)[11] will decrease, enabling the rapid development of the Internet of Things and artificial intelligence, as well as entirely new applications ranging from smart clothing monitoring the user's health, to entire smart cities [Cyfryzacja KPRM,

[8] In terms of these programmes, the following regulations are relevant: Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, in particular with regard to the obligation to provide wholesale telecommunications services (Article 52(5) in conjunction with Article 2(139) of the GBER) and co-location and supervision services which are necessary for the provision of the services explicitly referred to in Article 2(139) of the GBER; and further, the EU Guidelines for the application of State aid rules to the rapid deployment of broadband networks (2013/C 25/01), as well as the Act of 7 May 2010 on Support for the Development of Telecommunications Services and Networks, which stipulates the Obligation to provide Access to Telecommunications Infrastructure Constructed, Extended or Reconstructed with State Aid.

[9] Today's 4G/LTE/LTE-Advanced networks theoretically allow data transmission at a speed of 300 Mbps. The fifth generation network will allow data transmission at speeds of up to 10 Gbps (approximately 40 times faster). This speed will power other new technologies, such as autonomous vehicles, whose sensors receive and process vast amounts of data in real time.

[10] Up to 1 million devices per 500 km^2 can simultaneously connect to an LTE network. The 5G network will allow the connection of 1 million devices per 1 km^2.

[11] In fourth generation networks, the latency between sending data and receiving a feedback signal averages 50 ms, and in a 5G network – as low as 1 ms. In practice, this means, for example, that the 5G network will allow remote control of various devices, such as cars, construction machinery, or medical robots. Through the use of a robot, a surgeon will be able to perform surgery on a patient located on another continent.

2019]. The possibilities of utilizing artificial intelligence in healthcare are becoming more advanced: software comparing specific patient data with relevant information on the results and course of illness in other patients 'suggests' to the doctor the optimum treatment path, supporting the decision-making process [Cembrowska, 2023]. Furthermore, the use of advanced ICT systems will enable the utilization of robotics in medical procedures – conducting remote surgeries [Telemedyczna Grupa Robocza, 2018, p. 43].

10.6. Risks involved in the digital transformation of healthcare

Apart from the obvious positive aspects associated with telemedicine and its development, it also entails some risks. These risks can be broadly divided into two types. One is related to the manner and quality of healthcare provided, while the other is related to the risk of disclosure of medical data that is legally protected.

As technology progresses, patients are exposed to a greater risk of a lack of professionalism on the part of healthcare providers. It is therefore necessary to specify in more detail which areas can be covered by a telemetry service, as well as the conditions of patient eligibility for such diagnostics. Issuing prescriptions, medical certificates or referrals without the relevant examinations should be precluded. Provisions on the technical requirements to be met by a telemedicine service provider should also be made more specific [Chojecka, Nowak, 2016, p. 74].

Using a variety of technical means, from text messaging and e-mail to sensors and mobile apps, telemedicine offers an opportunity to collect a significant amount of medical, physiological, lifestyle and daily activity data [Chojecka, Nowak, 2016, p. 81]. Article 2(7) of the Act of 28 April 2011 on the Healthcare Information System [Journal of Laws 2011, no. 113, item 657 as amended] stipulates that individual health data is personal data and other data of natural persons concerning eligibility for provided, administered and planned healthcare services, health status, as well as other data processed in connection with planned, provided and administered healthcare services, health prevention and implementation of health programmes. In turn, Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation, GDPR) [Official Journal of the EU 2016, L 119] goes much further. Under Article 4(15) of the GDPR, 'data concerning health' means personal data related to the physical or mental health of a natural person, including the provision of healthcare

services, which reveals information about his or her health status. Article 9(1) of the GDPR classifies this data under special categories of personal data.

Medical data includes in particular: a description of the health services provided; a diagnosis of the disease, health problem, injury or pregnancy or a description of the functional status; recommendations; information on certificates, judgments and opinions issued; information on medicinal products, including dosage, or medical devices prescribed to the patient or medical device supply orders. This information is collected for instance in the health and medical history, the individual physiotherapy care records, the community and family interview sheet, the surgery report, the pregnancy records, and a child's health records [Journal of Laws 2022, item 1304]. The data contained in the medical records constitutes medical data falling under the category of sensitive personal data. A guarantee to protect such data is required by law. Failure to provide this protection should entail administrative or even criminal liability. In the case of telemedicine, access to this data is incomparably easier, and this is due not only to hacking, but also to the irresponsible policies and activities of government officials. Effective protective, preventive and, consequently, punitive mechanisms need to be established. As the case of the disclosure by the Minister of Health of the content of a doctor's prescription [Public Information Bulletin of the Ombudsman, 2023a] or of the securing by the Central Anticorruption Bureau of the medical records (in traditional and electronic form) of patients of a gynaecological practice dating back nearly thirty years [Public Information Bulletin of the Ombudsman, 2023b] has shown, the current mechanisms are insufficient.[12]

10.7. Conclusions

In the near future, thanks to new technologies, a doctor will be able to wear special (Mixed Reality) glasses and remotely consult on various issues, such as skin lesions in a dermatology patient or other ailments that would typically require an in-person visit. In 2019, the world's first remote brain surgery using 5G technology was successfully conducted [Siwik, 2019]. The widespread use of telemedicine will facilitate the advancement of health monitoring for patients, including the elderly, as demonstrated by existing applications such as PulsoCare [2023] in Poland – the official tool of the Ministry of Health for remotely monitoring COVID-19 patients in home isolation. The application (a smartphone-based IT system) reads a patient's heart

[12] The provision of data in this regard must be specified by an Act (Article 51(5) of the Constitution of the Republic of Poland) and must be necessary in a democratic state ruled by law (Article 51(2) of the Constitution of the Republic of Poland).

rate and oxygen saturation from a pulse oximeter. In the future, similar applications will be used not only in medical diagnostics but also to streamline the operations of medical facilities [Białas, 2016]. The provision of telemedical services requires the construction of a modern, secure information infrastructure (data centres) based on proven data processing and archiving technologies, as well as incurring the costs of its maintenance. It also necessitates hiring specialists competent to manage such infrastructure [Olszanowski, Gierek, Skrzypek, 2016, p. 23].

Efforts in the digital transformation of healthcare in Poland, despite the rapid growth in their utilization, will not be revolutionary. The reason for this is the gradual expansion of the infrastructure that enables the provision of these services [Maziarz, 2010, p. 40]. Legal regulations must keep pace with the rapidly changing reality and scientific progress to eliminate potential uncertainties in this area [Czarnuch, Partyka-Opiela, Najbuk, Pachocki, 2015, p. 6]. As a result, it may be necessary to develop an interdisciplinary standard for providing telemedical services [Telemedyczna Grupa Robocza, 2021, p. 4], for which an appropriate statutory basis will be essential.

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Chapter 11

Cultural Determinants of Public Health – Analysis for the European Countries

Lidia Danik, Małgorzata Stefania Lewandowska

11.1. Introduction

The health of a nation is often perceived solely in terms of healthcare expenditure, and according to this principle, the higher the expenditure, the better the expected outcome. However, this has been proven incorrect by the examples of countries such as the United States, where the world's highest healthcare spending does not translate at all into the greatest life expectancy of citizens [Matus, 2021]. Moreover, when it comes to life expectancy, the United States is a long way behind countries which have much lower healthcare expenditure. In 2023, the United States ranked a distant 47th in this respect, behind countries such as Hong Kong (1st), French Polynesia (11th), Slovenia (29th) or Czechia (46th) [Worldometer, 2023].[1] Thus, these differences are not only due to the level of expenditure, the way healthcare services are organised, or health awareness [Kosycarz, 2018], but also to the social relations in particular countries [Hall, 2010].

The analysis of the impact of culture on health is still a new and only marginally explored area of research, but despite this, culture can be linked to the health level in a variety of ways. It determines all behaviours and norms of members of a community, including those related to self-care (e.g., alcohol consumption, sexual abstinence, the cult of youth) [Jaroszewska, 2013], taking up treatment [Jaroszewska, 2013], support for other members of society or the way health services are organised, the effectiveness of their activities [Braithwaite, Tran, Ellis, Westbrook, 2020], or the organisational culture in health service providers [cf., Cowling, Lawson, 2020]. Strong links between culture and the level of health of the population can be observed especially in countries with relatively low levels of economic development, poorer health infrastructure and lower levels of technological development [Bakry, Kavalamthara, Cyril, Liu, 2021].

[1] Poland ranked 54th on this list.

In the context of the above, the aim of the following study is to identify the impact of national culture on public health in selected European countries, including Poland. The study comprises several parts. This chapter begins with a discussion of the concepts of culture and mental health as one component of individual well-being. Following this, the results of the research on the impact of the different cultural dimensions on public health will be presented, with a particular focus on the mental aspects. The theoretical discussion will be complemented by the results of the author's on a group of 29 European countries. The study is rounded off with conclusions and a summary.

11.2. The concept of culture

In this study, we will use the definition of culture proposed by Hofstede, who defined culture as the collective programming of the human mind that distinguishes the members of one human group from those of another [Hofstede, Hofstede, Minkov, 2011, p. 20]. Culture is an attribute of humans and encompasses the whole of their lives, including the most mundane activities. It is a collective creation, not an individual one, in the sense that, while individuals can influence the development of culture, this contribution would be meaningless without being put into social circulation. Accordingly, behaviours and values typical of a single individual are not culture. Culture evolves over time [Szacka, 2008, pp. 80–81].

Most studies on culture by contemporary researchers refer to Hofstede's work to a greater or lesser extent. His influence on cross-cultural research is unquestionable and his work, despite numerous controversies [Danik, 2017, pp. 81–86], has had the highest citation rate among works in the field [Kirkman, Lowe, Gibson, 2006].

Studies, descriptions and comparisons of individual national cultures make use of the concept of cultural dimensions, i.e., certain characteristics of a culture that can be measured and make it possible to determine the position of a culture in relation to other cultures [Hofstede et al., 2011, p. 46]. The dimensions most often used for this purpose are those proposed by Hofstede (power distance, individualism, motivation towards achievement and success, uncertainty avoidance, long-term orientation, indulgence) [cf., Hofstede Insights, 2023], and this approach will be adopted in this study.

11.3. Mental health and its importance for individual well-being

The ability of an individual to lead a fulfilling life, including the ability to study, work or pursue leisure interests, as well as the ability to make everyday personal or household decisions about education, employment, housing or other choices, is heavily dependent on mental health [Friedli, 2009], which is an important element of individual well-being.

The concept of well-being consists of several elements (well-being sub-components): welfare (material well-being), health (physical and mental well-being, combined with good functioning in one's environment), success (social well-being), access to cultural goods and creative opportunities (cultural well-being) and psychological well-being in the broad sense [Mirski, 2009].

Psychological well-being, in turn, is "the result of a cognitive and emotional evaluation of one's life, comprising high levels of fulfilment and life satisfaction" [Niśkiewicz, 2016]. The dimensions of psychological well-being are personal growth, purpose in life, environmental mastery, self-acceptance, autonomy, and positive relations with others [Gemini, 2023].

A review of the literature reveals that the level of mental health is a function of two independent but interrelated variables: positive mental health (PMH) and the presence or absence of mental health disorders [Keyes, 2014], the latter being defined as "a clinically significant disturbance in an individual's cognition, emotional regulation, or behaviour" [WHO, 2022]. Mental health and mental disorders are therefore not two ends of the same spectrum, and the absence of mental disorder is not the only prerequisite for good mental health [Keyes, 2005].

Mental health problems among citizens have serious financial implications for companies as well as for the economy as a whole. According to survey data collected in the United Kingdom, Germany and Australia, depression and anxiety are more common among people of working age than later in life. They contribute to an increase in the cost of the healthcare system and thus financial losses due to reduced productivity and the decline in the general well-being of citizens [Chisholm, Layard, Patel, Saxena, 2013].

11.4. The importance of culture for citizens' health – theoretical considerations

Power distance vs. level of health

Power distance (measured by the PDI index) indicates the degree to which community members who are low in the hierarchy accept the unequal distribution of power and wealth [Hofstede Insights, 2023]. Power distance determines the level of hierarchy in organisations and the relationships between social strata. In organisations with high power distance, employees fear to oppose the boss, accept dependence and an autocratic or paternalistic style of management [Hofstede et al., 2011, pp. 83–86].

In countries with high power distance, people in power are not expected to meet the same quality standards as their subordinates, which, in turn, can be used by less powerful groups as a justification for a discretionary approach to regulations [Borg, 2014], which can ultimately lead to lower healthcare standards. This is supported by research by Borisova, Martinussen, Rydland, Stornes and Eikemo [2017], according to which people in countries with high power distance have a worse opinion of the level of healthcare than in countries with low power distance. Nevertheless, a high level of hierarchy allows decisions to be implemented quickly, including those that are unwelcome to some parts of society, which, in a crisis situation such as the COVID-19 pandemic, was conducive to lowering the incidence of the disease [Bakry et al., 2021]. However, taking into account the previous arguments, and the fact that high power distance promotes unequal public access to resources, including health-related resources, we pose the following hypothesis:

- H1: Power distance has a negative bearing on social health.

Individualism vs. level of health

The dimension of individualism and collectivism (measured by the IDV index), relates to the extent to which individuals place their own interests above those of the collective, and to the interdependence maintained between members of society. In collectivist societies, people perceive themselves in terms of the group. Members of individualist societies look after themselves and their direct family only, whereas in collectivist societies people belong to groups that care for them in exchange for loyalty [Hofstede Insights, 2023].

According to a study by Matus [2021], there is a positive correlation between a higher level of individualism and increased life expectancy. This can be attributed

to 'healthy selfishness' which leads people to take more care of their own health. However, the relationship is not unequivocal, as collective action and sacrifice for the benefit of the collective can sometimes be necessary to ensure health security for the whole society, which was evident during the COVID-19 pandemic, when lower incidence rates were observed in collective-minded societies [Bakry et al., 2021]. Furthermore, support in a group can help reduce stress, anxiety and depression, although research findings in this area are not clear [cf., Gao, Yao, Guo, Liao, 2022]. Considering that an individualistic culture prompts people to look after the interests, including health interests, of themselves and their immediate family, we pose the following hypothesis:

- H2: Individualism has a positive bearing on social health.

Motivation towards achievement and success vs. level of health

Motivation towards achievement and success (formerly: masculinity vs. femininity; measured by the MAS index) indicates whether a society is driven by competition, achievement and success, with success being defined by the winner/best in field, as is the case in high achieving societies (this motivation is referred to as 'decisive'). In societies with a low score in this respect (consensus-oriented), the dominant values are caring for others and quality of life. A consensus-oriented society is one where quality of life is a sign of success and standing out from the crowd is not admirable. The most important differentiator in this case is whether people are motivated by their desire to be the best (decisive) or by enjoying what they do (consensus-oriented) [Hofstede Insights, 2023]. This dimension also illustrates gendered behavioural expectations. In decisive societies, men are expected to be tough, assertive and focused on material success, while women are expected to be modest, affectionate and concerned with quality of life. In consensus-oriented societies, both sexes are expected to care about others and to care about quality of life [Hofstede et al., 2011, pp. 156–157].

In emergency situations, quick reactions and rapid decision-making rather than consensus seeking may be necessary, which, in a situation such as the COVID-19 pandemic, led to a lower incidence of the disease in decisive-oriented countries [Bakry et al., 2021]. On the other hand, however, in success-driven cultures, collaboration that does not lead to prestigious achievements is not appreciated, and this can hinder the proper functioning of health services [Borg, 2014]. Moreover, in such cultures, there is no assumption that care is provided for the vulnerable, which can naturally translate into a lower health status of the whole population. Hence the following hypothesis:

- H3: Motivation towards achievement and success has a negative bearing on social health.

Uncertainty avoidance vs. level of health

Uncertainty avoidance (measured by the UAI index) indicates how society handles the fact that the future can never be known. Is the prevailing attitude one that involves the need to control the future, or one that just lets it happen? The extent to which members of a culture feel threatened by ambiguous or unknown situations and have created beliefs and institutions that help them avoid these is reflected in the uncertainty avoidance index [Hofstede Insights, 2023]. In countries with high levels of uncertainty avoidance, rigid codes of beliefs and behaviour are in place, and unusual behaviour and ideas are not tolerated. In these cultures, there is an emotional need for rules (even if the rules never work), it is believed that time is money, and people have an intrinsic need to be busy and work hard. Precision and punctuality are taken as standards. Innovation comes with resistance, and the basis of individuals' motivation is their need for security [Hofstede Insights, 2023].

In countries with high uncertainty avoidance, more use of antibiotics, prescribed on a 'just in case' basis, is expected. However, Borg's [2014] research on nurses shows that the bureaucracy and dogmatic approach in such societies is often an unnecessary chore that gets in the way of good patient care, so it is acceptable in their work to try to 'take shortcuts'. Moreover, it is also usual to resist change, and it is relatively common to ignore situations and information considered undesirable, although, once it becomes clear that if no change is made, it will result in total failure, then change can be implemented quite swiftly [Borg, 2014]. Research has confirmed that countries with high uncertainty avoidance fared worse during the COVID-19 pandemic [Bakry et al., 2021], which leads us to pose the following hypothesis:

- H4: Uncertainty avoidance has a negative bearing on social health.

Long-term orientation vs. level of health

Long-term orientation (measured by the LTO index) describes how a society deals with its past and how it tackles the challenges of the present and future. Societies with short-term orientation prefer to maintain traditions and norms and are sceptical about social change. In long-term-oriented cultures, thrift is encouraged and effort is put into the development of modern education as a way to prepare for the future [Hofstede Insights, 2023].

Long-term-oriented societies invest in their future, while short-term-oriented ones tend to prioritise the preservation of customs and traditions, placing the present above the future. Such societies have a slower uptake of innovation and weaker adaptation to their environment, which can translate into shorter lives of their members [Matus,

2021], as was confirmed during the COVID-19 pandemic [Bakry et al., 2021]. Hence the hypothesis:

- H5: Long-term orientation has a positive bearing on social health.

Indulgence vs. level of health

This dimension (measured by the IVR index) is defined as the extent to which people try to control their desires and impulses, based on the way they were raised. Societies that do not require significant control from their members are referred to as 'indulgent', while their opposite is referred to as 'restrained'. In restrained societies, a sense of helplessness, pessimism, cynicism and strong social control are prevalent, whereas in indulgent societies, a strong sense of control over life, a lack of high regard for precaution and thrift, and a positive attitude towards life are widespread [Hofstede et al., 2011, p. 296].

In a pandemic situation, the acceptance of indulgence has translated into higher levels of the disease in lower-income countries [Bakry et al., 2021]. Yet, in indulgent societies, people take more care of themselves and reward themselves, which can translate into a longer life [Matus, 2021], partly due to better mental health. Hence the hypothesis:

- H6: Indulgence has a positive bearing on social health.

11.5. The relationship between Hofstede's cultural dimensions and the level of mental health of citizens from European countries

The empirical part of the study covers 29 European countries which were Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, and Switzerland.

Data on the cultural dimensions is taken from the Hofstede website, where the results of the Values Survey Module [VSM, 2013] are published.

Cultural dimensions are evaluated on a scale from 0 to 100, and reflect: 'power distance' (PDI synthetic index); 'individualism' (IDV synthetic index); 'motivation towards achievement and success' (MAS synthetic index); 'uncertainty avoidance' (UAI synthetic index); 'long-term orientation' (LTO synthetic index); 'indulgence' (IVR synthetic index).

One of the variables from the European Health Interview Survey (EHIS) questionnaire being implemented in 2019 was used as a measure of the level of mental health of the citizens of the countries surveyed. This survey is performed regularly every five years in all countries of the European Union and the results are used to develop health policy at national and European level. It provides comprehensive knowledge about the health situation of the population in the European Union and associated countries [Statistics Poland, 2019].

One of the questions in the questionnaire concerns **the level of declared mental health and the presence of symptoms that may indicate depression** [Statistics Poland, 2019]. The 2019 EHIS used a shortened version of the Brief Patient Health Questionnaire, Depression Module (PHQ-9), based on the criteria for measuring depression from the *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition* [DSM, 1994]. The problems diagnosed included: little interest or pleasure in doing things*;* feeling down, depressed or hopeless*;* trouble falling or staying asleep, or sleeping too much*;* feeling tired or having little energy*;* poor appetite or overeating; feeling negative about oneself or that one is a failure or has let oneself or one's family down; trouble concentrating on things, such as reading the newspaper or watching television; moving or speaking so slowly that other people could have noticed, or being so fidgety or restless that one has been moving around a lot more than usual.

In the 'severity of depressive symptoms' indicator, the scores obtained in the answers to all the questions asked about depressive symptoms were added up and grouped into ranges, indicating the severity of depressive symptoms: 8–12 pts (none); 13–17 pts (mild); 18–22 pts (moderate); 23–27 pts (moderately severe); 28–32 pts(severe). **Our study used the responses for the latter group**.

At the end of the chapter, Table A11.2 provides the above questions in table form so that the reader can use them to self-assess their mental state.

The answers are declarative, and do not constitute a basis for determining depression. The study identifies individual symptoms that may indicate a mental disorder, but may also result from other unrelated conditions.

This part of the study will present the results of an empirical study of the relationship between the previously discussed cultural dimensions and the declared state of mental health and the presence of symptoms that may indicate depression, conducted for a group of 29 European countries, including Poland.

As an initial remark, none of the hypotheses posed were confirmed for the entire population under study, as no statistically significant correlations were found. However, it is worth taking a closer look at the analyses, as they reveal certain trends.

The analysis of the first correlation, conducted for the cultural dimension 'power distance' and for the declared state of mental health and the presence of symptoms

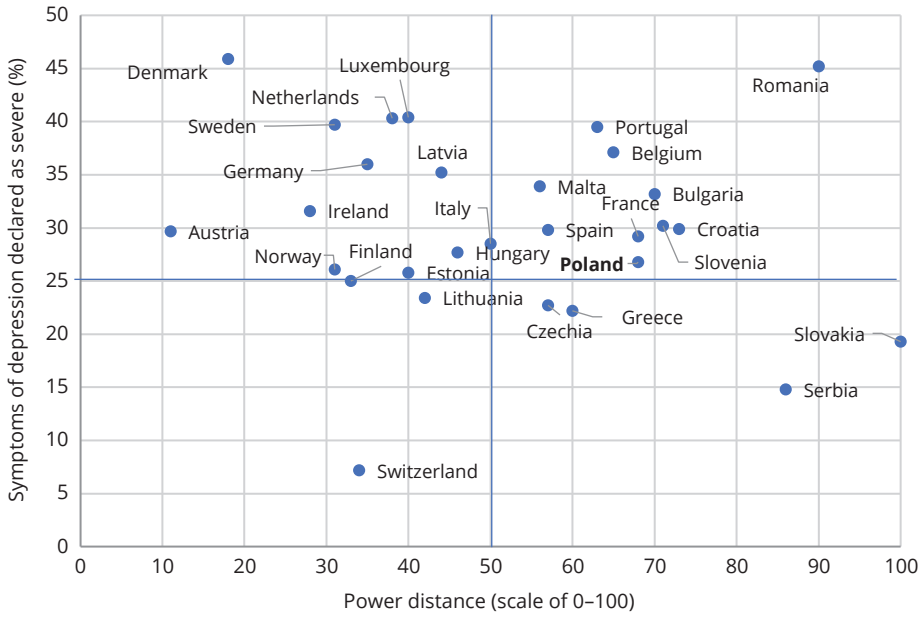
that may indicate depression for selected European countries, including Poland, shows no statistical relationship, however, it does show certain trends. In the theoretical part, we assumed that "power distance has a negative bearing on social health" (H1), but this hypothesis is not supported by the results obtained. A large group of countries, 13 out of 29, have a low power distance and a high or very high percentage of people reporting mental health problems. This group includes some of the wealthy EU countries such as Denmark, Luxembourg, Sweden, the Netherlands, Germany, Norway, and Finland.

Poland is one of ten countries where power distance is relatively high and the percentage of responses indicating mental problems is also high, although not the highest.

Romania stands out strongly from this group, where a very high power distance is coupled with a high percentage of people declaring mental health problems.

Switzerland, on the other hand, is at the other end, with both values at low levels. See Figure 11.1 for details for the 29 countries surveyed.

Figure 11.1. Relationship between the cultural dimension 'power distance' (scale of 0–100) and the level of declared mental health and the presence of symptoms that may indicate depression in selected European countries (% of responses)



Source: own elaboration based on Hofstede [2013] and EHIS [2019] data.

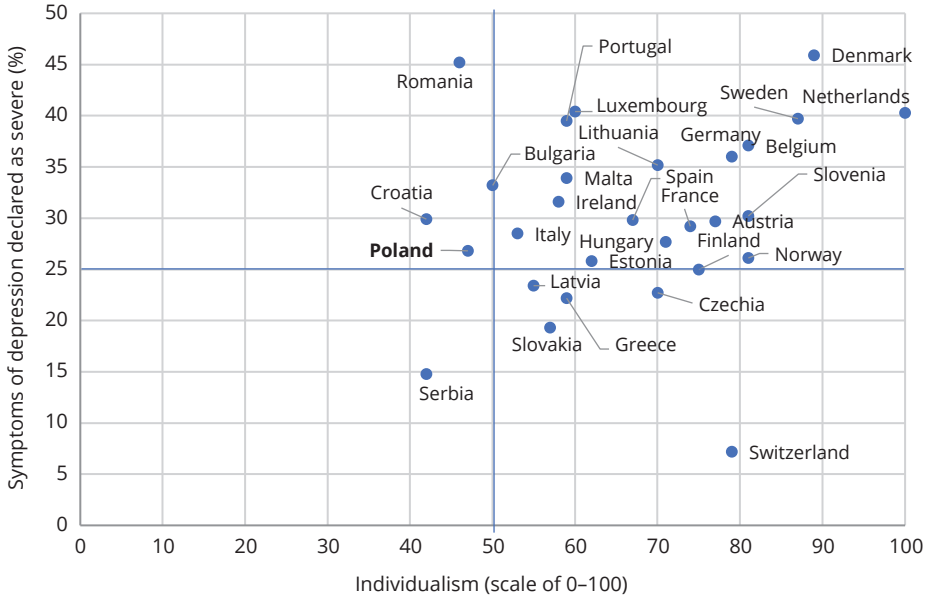
The analysis of the second correlation, conducted for the cultural dimension 'individualism' and for the declared state of mental health and the presence of symptoms that may indicate depression for selected European countries, including Poland, shows no statistical relationship, however, it does show certain trends. In the theoretical part, we assumed that "individualism has a positive bearing on social health" (H2), however this hypothesis is not supported by the results obtained. A large group of countries, 20 out of 29, have a high level of individualism and a high or very high percentage of people reporting mental health problems. Again, this group includes wealthy EU countries such as Austria, Denmark, Luxembourg, Sweden, the Netherlands, Germany, Norway, and Finland.

Poland is one of three countries where individualism is relatively low and the percentage of responses indicating mental problems is high, although not the highest.

Romania stands out strongly from this group, where a high level of collectivism is coupled with a high percentage of people declaring mental health problems.

Switzerland, on the other hand, is at the other end, with a high level of individualism coupled with a low level of declared mental health problems. See Figure 11.2 for details for the 29 countries surveyed.

Figure 11.2. Relationship between the cultural dimension 'individualism' (scale of 0–100) and the level of declared mental health and the presence of symptoms that may indicate depression in selected European countries (% of responses)



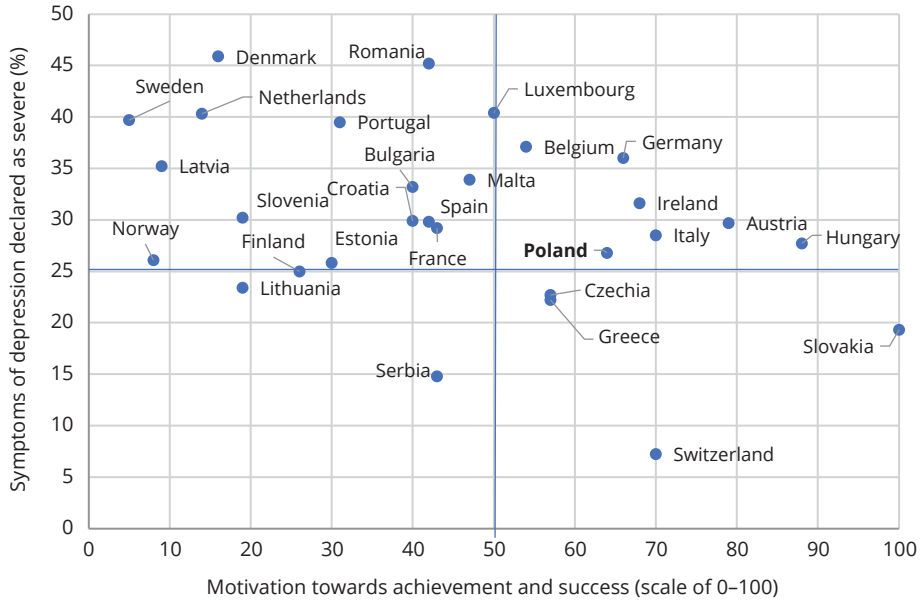
Source: own elaboration based on Hofstede [2013] and EHIS [2019] data.

The analysis of the third correlation, conducted for the cultural dimension 'motivation towards achievement and success' and for the declared state of mental health and the presence of symptoms that may indicate depression for selected European countries, including Poland, shows no statistical relationship. However, again, it does show certain trends. In the theoretical part, we assumed that "motivation towards achievement and success has a negative bearing on social health" (H3), but this hypothesis is not supported by the results obtained. A large group of countries, 16 out of 29, have a relatively low level of motivation towards achievement and success and a high or very high percentage of people reporting mental health problems. Again, this group includes wealthy EU countries such as Denmark, Luxembourg, Sweden, the Netherlands, Germany, Norway, Finland, and France.

Poland is one of seven countries where motivation towards achievement and success is relatively high and the percentage of responses indicating mental problems is high, although not the highest.

Switzerland, again, stands out from the surveyed population, with a high level of motivation towards achievement and success coupled with a low level of declared mental health problems. See Figure 11.3 for details for the 29 countries surveyed.

Figure 11.3. Relationship between the cultural dimension 'motivation towards achievement and success' (scale of 0–100) and the level of declared mental health and the presence of symptoms that may indicate depression in selected European countries (% of responses)



Source: own elaboration based on Hofstede [2013] and EHIS [2019] data.

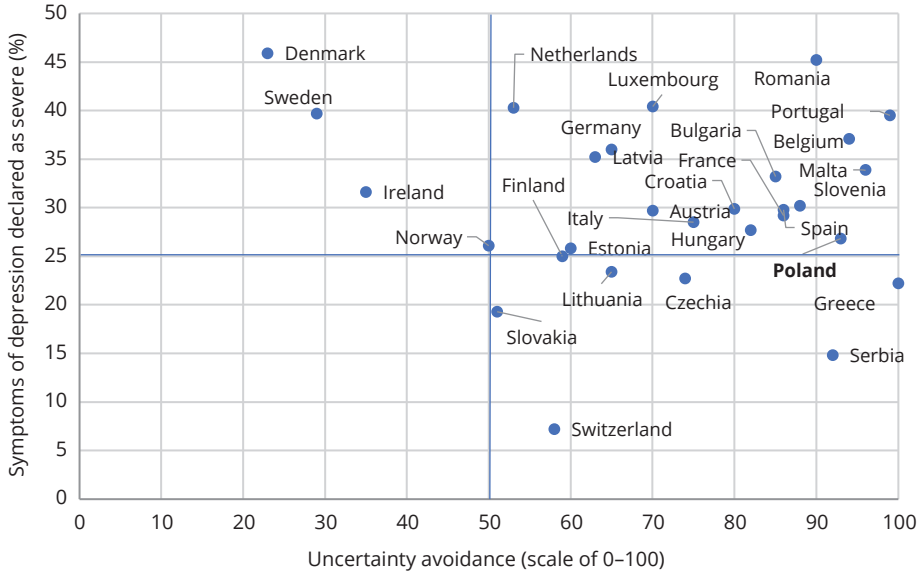
The analysis of the fourth correlation, conducted for the cultural dimension 'uncertainty avoidance' and for the declared state of mental health and the presence of symptoms that may indicate depression for selected European countries, including Poland, shows no statistical relationship. However, it does show certain trends. In the theoretical part, we assumed that "uncertainty avoidance has a negative bearing on social health" (H4), but this hypothesis is not supported by the results obtained for the group as a whole. However, a large group of countries, 20 out of 29, have a high level of uncertainty avoidance and a high or very high percentage of people reporting mental health problems. Again, this group includes wealthy EU countries such as Austria, Luxembourg, the Netherlands, Germany, Norway, and Finland.

Poland is also among this group of countries.

Romania stands out strongly from this group, where a very high level of uncertainty avoidance is coupled with a high percentage of people declaring mental health problems.

Switzerland, again, does not fit the pattern, with its high level of uncertainty avoidance coupled with a low level of declared mental health problems. See Figure 11.4 for details for the 29 countries surveyed.

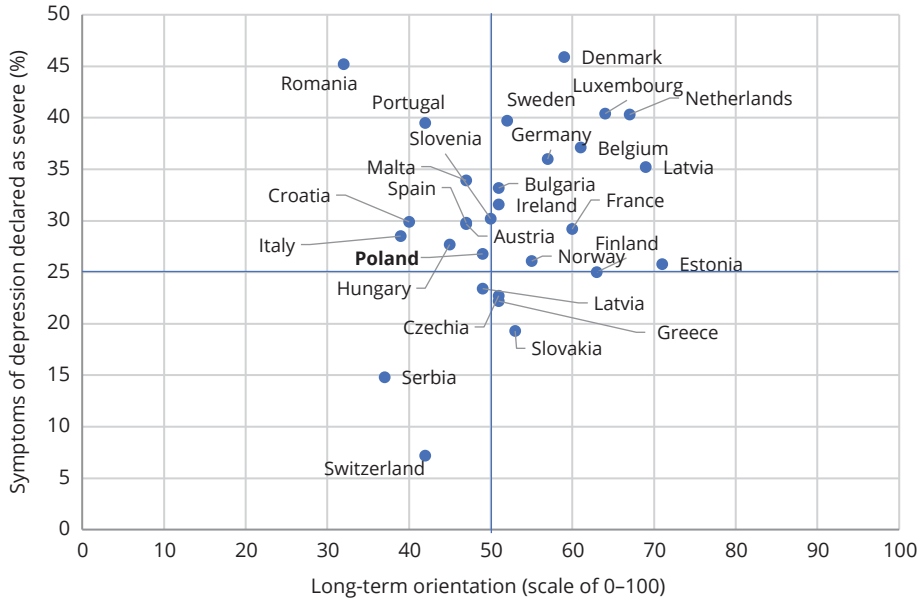
Figure 11.4. Relationship between the cultural dimension 'uncertainty avoidance' (scale of 0–100) and the level of declared mental health and the presence of symptoms that may indicate depression in selected European countries (% of responses)



Source: own elaboration based on Hofstede [2013] and EHIS [2019] data.

The analysis of the fifth correlation, conducted for the cultural dimension 'long-term orientation' and for the declared state of mental health and the presence of symptoms that may indicate depression for selected European countries, including Poland, again shows no statistical relationship and no trends. In the theoretical part, we assumed that "long-term orientation has a positive bearing on social health" (H5), but this hypothesis is not supported by the results obtained for the group as a whole. See Figure 11.5 for details for the 29 countries surveyed.

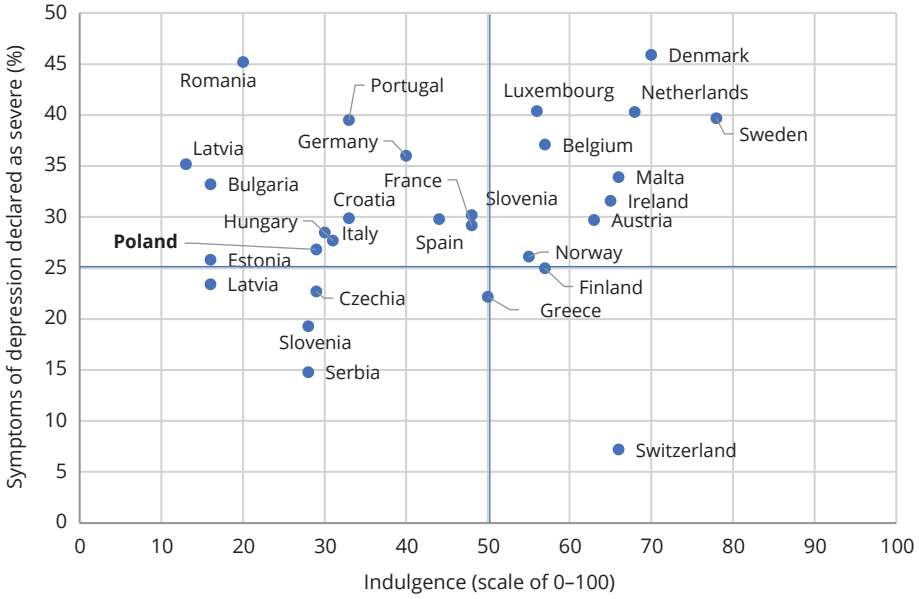
Figure 11.5. Relationship between the cultural dimension 'long-term orientation' (scale of 0–100) and the level of declared mental health and the presence of symptoms that may indicate depression in selected European countries (% of responses)



Source: own elaboration based on Hofstede [2013] and EHIS [2019] data.

The analysis of the sixth correlation, conducted for the cultural dimension 'indulgence' and for the declared state of mental health and the presence of symptoms that may indicate depression for selected European countries, including Poland, again shows no statistical relationship and no trends. In the theoretical part, we assumed that "indulgence has a positive bearing on social health" (H6), but this hypothesis is not supported by the results obtained for the group as a whole. This hypothesis is only confirmed for Switzerland. See Figure 11.6 for details for the 29 countries surveyed.

Figure 11.6. Relationship between the cultural dimension 'indulgence' (scale of 0–100) and the level of declared mental health and the presence of symptoms that may indicate depression in selected European countries (% of responses)



Source: own elaboration based on Hofstede [2013] and EHIS [2019] data.

11.6. Conclusions

According to the World Health Organisation, the health of a population is determined by many factors, such as place of residence, the state of the environment, genetics, education and income levels, access to healthcare services, and relationships with friends and family [WHO, 2017]. Many of these factors are culturally determined, as it is culture that influences people's lifestyles and behaviour.

In this context, the aim of this study was to show to what extent the culture of a society, classified according to Hofstede, is relevant to the health of citizens.

The study used six cultural dimensions: 'power distance', 'individualism', 'motivation towards achievement and success', 'uncertainty avoidance', 'long-term orientation' and 'indulgence', while declarations about mental health status and the presence of symptoms that may indicate depression were used to measure citizens' health.

The analysis did not confirm in a statistically significant way the presence of the assumed correlations, although it did reveal some trends. At this point, however, it should be mentioned that the cultural dimensions proposed by Hofstede and attributed

to specific nations do not necessarily reflect the reality of all their citizens, and run the risk of simplification.

The results of the EHIS survey indicate more explicitly that strong declarations of serious mental health problems are more common in wealthy countries such as Denmark, Sweden, Luxembourg, the Netherlands, Germany, and Belgium. This seems to support the thesis presented by researchers that consumer societies are more likely to have a diminishing sense of psychological well-being and many of their citizens lose the natural pleasure of life. As noted by Kanasz [2015, p. 41]: "The research reveals the paradox of a society of consumption and welfare as expressed by the phrase «getting better (more) and feeling worse»".

The study presented (in fact, contrary to expectations) shows that individualistic societies (mostly wealthy European countries) are more likely to suffer from mental health problems than collectivistic societies. This may be due to increased responsibility on the one hand and a lack of support from the environment on the other. Also, higher levels of rationalisation of behaviour can result in greater feelings of guilt and frustration when behaviour deviates from standards that are considered generally acceptable [Jaroszewska, 2013].

Mental well-being is therefore not something exclusive to highly developed countries, although the example of Switzerland shows that there are wealthy societies where citizens manage to maintain high levels of mental well-being.

At this point, it is perhaps worth mentioning which factors, apart from cultural ones, lead to a good mental state. Research conducted on data from the 2013–2014 EHIS for more than 140 thousand working people from thirty European countries indicates that mental health is influenced by many demographic, economic and lifestyle factors [Majcherek, Kowalski, Lewandowska, 2022]. The likelihood of mental health problems decreases significantly among people who have a normal BMI, eat several servings of vegetables or fruit each day, do not smoke, are in a stable relationship, are surrounded by family and friends and have access to research.

These findings are confirmed by the well-known happiness researcher, Professor Richard Layard [Layard, 2006]. Looking for reasons why people feel happy or not, he points to economic factors, but interpersonal relationships, family life, and work and whether we enjoy it, are more important than wealth.

To conclude, many mental and physical health problems can be prevented by a better lifestyle (e.g., more exercise, better sleep, diet, social activity, volunteer work). However, the right lifestyle choices are made in specific environments which need to be fostered, which is the responsibility of policy-makers and politicians.

Governments and healthcare systems have, therefore, a major role to play in this respect, so as to promote prevention of mental and physical health problems

[Barrington-Leigh, 2022], thereby increasing citizens' ability to lead fulfilling lives, including the ability to study, work, pursue leisure interests, and make everyday decisions or other choices that determine their well-being [Barrington-Leigh, 2022].

Appendix

Table A11.1. Overview of Hofstede's cultural dimensions and declared level of mental health problems according to data from the EHIS 2020 questionnaire

Country	Power distance	Individualism	Motivation towards achievement and success	Uncertainty avoidance	Long-term orientation	Indulgence	Declaration of mental health problems
Austria	11	77	79	70	47	63	29.7
Belgium	65	81	54	94	61	57	37.1
Bulgaria	70	50	40	85	51	16	33.2
Croatia	73	42	40	80	40	33	29.9
Czechia	57	70	57	74	51	29	22.7
Denmark	18	89	16	23	59	70	45.9
Estonia	40	62	30	60	71	16	25.8
Finland	33	75	26	59	63	57	25.0
France	68	74	43	86	60	48	29.2
Greece	60	59	57	100	51	50	22.2
Spain	57	67	42	86	47	44	29.8
Netherlands	38	100	14	53	67	68	40.3
Ireland	28	58	68	35	51	65	31.6
Lithuania	42	55	19	65	49	16	23.4
Luxembourg	40	60	50	70	64	56	40.4
Latvia	44	70	9	63	69	13	35.2
Malta	56	59	47	96	47	66	33.9
Germany	35	79	66	65	57	40	36.0
Norway	31	81	8	50	55	55	26.1
Poland	**68**	**47**	**64**	**93**	**49**	**29**	**26.8**
Portugal	63	59	31	99	42	33	39.5
Romania	90	46	42	90	32	20	45.2
Serbia	86	42	43	92	37	28	14.8
Slovakia	100	57	100	51	53	28	19.3
Slovenia	71	81	19	88	50	48	30.2

Country	Power distance	Individualism	Motivation towards achievement and success	Uncertainty avoidance	Long-term orientation	Indulgence	Declaration of mental health problems
Switzerland	34	79	70	58	42	66	7.21
Sweden	31	87	5	29	52	78	39.7
Hungary	46	71	88	82	45	31	27.7
Italy	50	53	70	75	39	30	28.5

Source: own elaboration based on Hofstede [2013] and EHIS [2019] data.

Table A11.2. Self-assessment test of the declared state of mental health and the presence of symptoms that may indicate depression

	Over the last two weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly every day
1	Little interest or pleasure in doing things	1	2	3	4
2	Feeling down, depressed or hopeless	1	2	3	4
3	Trouble falling or staying asleep, or sleeping too much	1	2	3	4
4	Feeling tired or having little energy	1	2	3	4
5	Poor appetite or overeating	1	2	3	4
6	Feeling negative about yourself or that you are a failure or have let yourself or your family down	1	2	3	4
7	Trouble concentrating on things, such as reading the newspaper or watching television	1	2	3	4
8	Moving or speaking so slowly that other people could have noticed; or being so fidgety or restless that you have been moving around a lot more than usual	1	2	3	4

Notes: in the EHIS survey from which the above questionnaire was derived used the European Union-recommended 8-item Patient Health Questionnaire (PHQ-8) [see Statistics Poland, 2019]; in the 'severity of depressive symptoms' indicator, the scores obtained in the answers to all the questions asked about depressive symptoms should be added up and grouped into ranges, indicating the severity of depressive symptoms: 8–12 pts (none); 13–17 pts (mild); 18–22 pts (moderate); 23–27 pts (moderately severe); 28–32 pts (severe); please note that the answers are declarative and do not constitute a basis for determining depression – symptoms may indicate depression, but may also result from other unrelated conditions.

Source: EHIS questionnaire (mental health section).

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Conclusions

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This monograph addresses the concept of competitiveness, which includes the interrelated issues of well-being, quality of life and public health. Health is a key factor of human capital, affecting productivity and economic performance, and plays an important role in shaping the competitiveness of economies.

The analysis is divided into two parts: the first one determines Poland's competitive position in the EU, and the second one analyses the factors of its competitive capacity, particularly in public health.

The first part of the monograph, consisting of six chapters, discusses the basic concepts of competitiveness and its determinants in the context of health, welfare and happiness economics. The analysis begins with theoretical considerations of these issues, and then presents the competitive position of the Polish economy, with a focus on public health. An important element of this part is an analysis of income convergence in the European Union and the health care infrastructure in Poland, as well as an analysis of foreign trade and investment in the context of health-related sectors. The second part of the monograph focuses on Poland's competitive capacity in comparison with other EU countries and the factors that influence it, especially with regard to public health. The chapters that make up this part include an analysis of capital and labor resources, innovation in health-related sectors, digital transformation in health care and the impact of culture on public health.

Chapter 1 focuses on analysing the relationship between public health, well-being, the economics of happiness and the competitiveness of economies. The authors emphasize that contemporary economic changes and global challenges, such as the COVID-19 pandemic, aging populations and environmental degradation, are forcing a new approach to the concept of competitiveness. Traditional definitions of competitiveness, focusing mainly on economic growth and the ability to compete in international markets, are being supplemented by aspects of social well-being and quality of life. The authors pointed out that well-being and happiness economics, which include subjective life satisfaction and health status, are important determinants of productivity and competitiveness. They note that the health of individuals affects not only their ability to work, but also overall economic activity and entrepreneurship. At the macroeconomic level, the health of the population contributes to quality and

productivity, which consequently affects the international competitiveness of the economy. The chapter concludes with an analysis of Poland's position in international competitiveness rankings and a determination of the well-being of the population, taking into account aspects of health. The results indicate some deterioration in Poland's position in terms of public health, which is particularly evident in comparison with other Visegrad countries, however, there is a noticeable improvement in the quality of the environment. It is emphasized that public health is a key element of competitiveness, and investment in health can bring long-term benefits to the economy.

Chapter 2 focuses on income convergence in the EU and the determination of Poland's competitive position using the so-called 'competitiveness pentagon'. In the group of 27 countries of the enlarged European Union, there is income convergence in terms of both β-convergence and σ-convergence. The rate of economic growth in 1993–2023 was negatively related to the initial level of GDP per capita. EU member states from Central and Eastern Europe achieved faster economic growth rates than Western European countries, even though the initial level of GDP per capita in Central and Eastern European countries was much lower. Income disparities have been narrowing, especially after 2000, although they are still large. However, one cannot unconditionally expect a reduction in differences in competitiveness as measured by the standard of living of the societies of EU countries in the short term. The acceleration of the convergence process will depend, among other things, on properly implemented economic policies directed at reducing differences in the level of development between Central and Eastern Europe and Western Europe. The war in Ukraine and the energy crisis will also have a significant impact on future economic growth. They carry the danger of a significant weakening of convergence and even the emergence of divergent tendencies in the future. However, if this pessimistic scenario does not materialize, CEE countries will continue on a path of rapid economic growth and narrow the development gap with Western Europe.

Chapter 3 focuses on the analysis of the state of health infrastructure in Poland compared to other EU countries. The main purpose of this chapter is to assess the efficiency and quality of the health care system in Poland and to identify areas for improvement. The results indicate that Poland has lower health care spending measured as a percentage of GDP compared to other EU countries. The percentage of private health spending in Poland is higher than the EU average, suggesting a greater financial burden on patients. The number of health care professionals and primary care physicians per 100 thousand population in Poland is significantly lower than the EU average, which affects the availability and quality of health care services. The chapter's conclusions suggest the need for a long-term strategy for the development of Poland's health care system, increasing financial outlays for health and improving

the efficiency of health resource management. The importance of adapting the health care system to the changing demographic and epidemiological needs of society is also emphasized.

Chapter 4 analyses the activity of foreign capital in Poland and Polish investment abroad, taking into account health-related industries. Human capital is playing an increasingly important role in both economic and social development, and its accumulation is linked to foreign direct investment. The key element of human capital is health, without which the other elements of human capital are irrelevant from the perspective of economic development. The analysis of secondary data showed that – according to the literature – there is no relationship between foreign direct investment in Poland and health (represented by life expectancy at birth and mortality). The lack of the examined relationship may be due to the low level of foreign direct investment located in Poland in the area of health.

Chapter 5 analyses Poland's foreign trade with a focus on health-related industries. The healthcare sector is one of the most important sectors of the global economy, and the resilience of the healthcare sector's value chains became a major focus of scientific discourse during the COVID-19 pandemic. This thesis aims to analyse Poland's foreign trade with a focus on the healthcare sector. Since its accession to the European Union in 2004, Poland's economy has maintained, almost continuously, a deficit in goods trade and a negative balance of the current account; the only exception was in 2020. On the other hand, Poland's balance in services has always been strongly positive. In 2022, Poland had a current account deficit (3.2% of GDP), a goods trade deficit (USD 25.5 billion), and a services trade surplus (USD 38.3 billion). In 2022, Poland recorded a high goods trade surplus with its most important trading partner, namely Germany (USD 20.2 billion), and a goods trade deficit with China (USD 44.1 billion), Russia (USD 11.8 billion) and the United States (USD 5.8 billion). In 2020, the categories of products exported by Poland with the highest CAR included food products (2.33), wood products (2.32) and animal products (1.98). According to 2022 data, pharmaceutical products were Poland's 18th most important export product (USD 4.8 billion, 1.3% of total exports) and 8th most important import product (USD 8.4 billion, 2.4% of total exports). Globally, Poland was their 22nd largest exporter and 20th largest importer.

The results of the research presented in Chapter 6, on total factor productivity (TFP), indicate that productivity changes have played a significant role in the economic growth of Poland and other CEE EU countries. In Poland, the average TFP growth rate was 1.9% per year between 2013 and 2022, the second-highest in the CEE group (Romania was the leader with a productivity growth rate of 2.3%). Poland's TFP growth should be interpreted as an improvement in the competitiveness of the Polish

economy. Higher factor productivity means increased economic efficiency and a better competitive position in the international environment. The COVID-19 pandemic negatively affected TFP dynamics. CEE EU countries recorded a decline in total factor productivity in 2020 and, barring a successful 2021 – not all of them returned to a stable path of regular TFP growth until 2022.

Part II of the monograph begins with Chapter 7, which presents investment and savings in Poland in an international comparative perspective in relation to other European Union countries. The level of private and public savings largely determines a country's investment opportunities. With this statement in mind, a comparison of investment and savings in Poland against other EU countries was made. First, on the basis of a report by the European Central Bank, the variation in the amount of citizens' savings in different EU countries was presented (in this area, Poland came out as a country with a relatively high share of cash, placed in deposits, and a low share placed in stocks and investment funds). This was followed by a review of the literature on private and public investment, which, in turn, formed the basis for an analysis of the structure of spending in this area in individual EU countries. Finally, the structure of health care spending in the EU is presented with Poland leading the ranking.

The purpose of Chapter 8 is to determine the competitiveness of the labor market and the well-being of workers in Poland. On the basis of analysed statistical data on, among other things, labor productivity, employees performing remote work, employee sickness absenteeism or benefit levels, the following conclusions are drawn. The Polish labor market is characterized by a relatively low unemployment rate, a pool of highly educated and skilled workers and a gradual increase in their productivity. However, it is worth noting that there are a number of disturbing trends in the Polish labor market that require observation and implementation of appropriate measures. One of them is its lost potential in the form of a low probability of transition to the state of employment for the unemployed, including a significant number of women with higher education. Secondly, Poland is seeing a relatively low percentage of people working remotely and a rising rate of absenteeism, especially among women. This indicates limited flexibility in work arrangements, a lack of employer trust in employees, and the persistent belief that work is still defined by where it is done, not by the results obtained. This attitude toward employees makes it difficult to ensure inclusiveness. In addition, the structure of job opportunities and the economy is changing as a result. In the case of the IT industry, this could mean a shift toward more specialized skills among the workforce. In summary, for the sake of the current and future well-being of employees and society, it is important to adopt a human resources approach that is person-centered, training and development-oriented.

Chapter 9 of the monograph analyses Poland's innovation in the health sector against the background of selected developed countries, focusing on macroeconomic, mesoeconomic and microeconomic aspects of innovation. Among other things, the chapter discusses health innovation systems, key clusters in the pharmaceutical industry and the level of innovation of Polish pharmaceutical companies compared to other EU countries. Poland is classified as a country with a relatively underdeveloped national health innovation system compared to other OECD countries. In recent years (2015–2021), there has been an improvement in innovation indicators concerning the area of health in Poland, including an increase in R&D spending in medical sciences and an increase in the number of medical patents. Clusters in high technology are key to innovation. In Poland, the pharmaceutical industry, although representing only 0.8% of global industrial production, plays an important role in cluster development. The analysis showed an insufficient level of cluster development in the health area in Poland, which is a barrier to further innovation growth. On the other hand, the pharmaceutical industry in Poland shows a high level of innovation, with 63.6% of companies introducing new or improved products in 2019–2021. However, generics account for a significant portion of production, limiting the share of revenue from the sale of new products in the sector's overall revenue.

Chapter 10 identifies system-legal opportunities for the provision and development of telemedicine services already provided, including bringing them up to current standards. The chapter shows that legal regulations are evolving enabling the provision of services in the telemedicine system to an increasing extent, and that investments in modern telecommunications infrastructure will accelerate the digital transformation of the health area by expanding the scope of these services, and improving their quality enabling greater professionalization of activities. However, the digital transformation activities of the health area in Poland, despite the rapid increase in their use, will not be revolutionary. The reason for this is primarily the gradual expansion of the infrastructure conditioning the provision of these services. Notwithstanding the above, legal regulations must keep up with the rapidly changing reality and scientific progress, so as to eliminate possible ambiguities in this area. Consequently, it may be necessary to develop an interdisciplinary standard for the provision of telemedicine services, for which appropriate statutory authorization will be necessary.

Chapter 11 examines the impact of national culture on public health. It turns out that high spending on health care does not always translate into better health outcomes, as the United States example shows. The analysis takes into account six dimensions of culture according to Hofstede: power distance, individualism, achievement and success orientation, uncertainty avoidance, long-term orientation and acquiescence, and is conducted for European Union countries. Although the study did not confirm

statistically significant relationships between culture and health, some trends were revealed, including, for example, higher indications of mental problems in rich EU countries with strongly individualistic cultures. Social well-being is not the domain of developed countries alone, and factors such as lifestyle, interpersonal relationships and social support play a key role in it. Governments and health systems should promote preventive health care to enhance citizens' ability to lead satisfying lives.

SGH

SGH SHAPES LEADERS

SGH Warsaw School of Economics is an innovative economic university that develops intellectual potential and creates leaders in response to the challenges of the future. It is an influential center for academic research, new ideas and initiatives undertaken by the academic community and alumni, as well as by business representatives, NGOs and public administration. As an autonomous and socially responsible university, SGH promotes ethical citizenship through its teaching, research and social engagement activities.

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Another considerable merit of the University is that both its alumni and its staff have been actively involved in shaping the economic and public spheres in Poland and Europe alike. Some of the most noteworthy examples include a former Polish prime minister and deputy prime ministers, the majority of ministers of finance after 1989, the first Polish commissionaire in the European Commission, two presidents of the National Bank of Poland, members of the Monetary Policy Council, presidents of the Polish Stock Exchange, chairpersons and members of the Polish Financial Supervision Authority, government experts, advisors, as well as specialists serving the European Union, other European institutions, and the UN.

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Global economy is facing many challenges, such as environmental degradation, climate change, natural disasters, unfavorable demographic trends and problems related to population migration. In the face of new challenges and high-risk and uncertainty, the question arises as to the adequacy of the concept of competitiveness to explain why some countries are raising their welfare levels and improving their citizens' quality of life faster than others. Does the research on competitiveness undertaken to date provide an answer to this question? Which elements that combine to form the competitiveness of economies have not been comprehensively analysed yet and require further exploration and in-depth study? In the context of the negative effects of the COVID-19 pandemic, health is an important area of focus for societies, especially scientists, entrepreneurs and politicians. The concept of competitiveness links health to welfare and quality of life, but studies devoted directly to this topic in the context of the competitiveness of economies are scarce. Health is mostly conceived as a component of human capital and is considered in this broader dimension, combined with education, in research on competitiveness. For this reason, in this monograph we address health from a narrower perspective – as a factor of competitiveness, and also include in the analysis other more subjective health-related elements that so far have appeared marginally in studies on the competitiveness of economies, such as happiness and well-being.

The aim of this monograph is to determine the competitiveness of the Polish economy compared to other EU countries, and to determine whether Poland is competitive in the area of health. In line with the pattern adopted in previous editions of this series of monographs published by the World Economy Research Institute of the SGH Warsaw School of Economics on the competitiveness of the Polish economy, the analysis is conducted from two perspectives: that of competitive ability and that of competitive position. Competitive ability encompasses the resources and skills needed to build competitive advantages in order to increase welfare and quality of life. Competitive position, in turn, reflects a country's performance resulting from the use of its own and foreign resources, productive capacities and institutions, and the benefits of participation in the international division of labour.

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